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PODOCARPUS FALCATA R. BR.

ERNEST H. WILSON

Plate 14

South Africa is not well supplied with indigenous species of softwood timber trees, several species of *Podocarpus* and of *Widdringtonia* representing the entire group. The *Widdringtonias*, called Cedars, occur in isolated areas; a few of them are plentiful but such that are do not grow to a large size, the exception being *W. Whytei* Rendle, indigenous on the Shire Highlands and adjacent regions of Central Africa. Several species of *Podocarpus*, however, are plentiful in regions where a good rainfall is enjoyed and among them *P. falcata* R. Br., the Yellow-wood or Geelhout of the Dutch, takes high rank as a timber tree. I am familiar with it in the splendid forests of the Knysna district, in the Tzitzikamma forests to the eastward and in the rain forests of Natal. It is reported from other parts of South Africa and would appear to me to be little, if at all, different from *P. gracilior* Pilger, a common tree in the forests of Kenya beyond Nairobi and which has been also reported from Abyssinia.

In Natal I saw fine trees of *P. falcata* R. Br., but they did not compare favorably in height and magnitude of trunk with those common in Knysna and Tzitzikamma. In these forests, which are dense with thick, almost impenetrable undergrowth, this tree rears itself high above the other vegetation, its dome-shaped or rounded crown over-shadowing that of any other tree. From the distance, where a view over the forests may be had, the tops of this *Podocarpus* stand out sentinel-like. The trunk varies in girth from 10 to 25 feet, is cylindrical, of even thickness for a great height, and usually clear of branches from 50 to 100 feet. The tallest tree I saw was 141 feet high and had a trunk 21 feet in girth. This was near Storms River in the Tzitzikamma. The largest specimen, however, was at Deep-wall in the crown forest of Knysna. This tree was well over 100 feet high, the bole $24\frac{1}{2}$ feet in girth, straight and without a branch for 62 feet. Conservator of Forests, P. J. Darmehl, who was with me, estimated this tree to contain 2,300 cubic feet of lumber.

The straightness of the trunk, its even thickness and freedom of branches mark it as an exceedingly valuable tree from the lumberman's point of view. The crown is relatively small, rounded or flattened, made up of a few thick branches and many smaller ones. Usually above where branch-

ing commences the tree is useless for timber. The bark is chocolate-brown and flakes off in relatively thick, irregular pieces leaving behind deeply impressed scars. In youth the bark is smooth and gray on the exterior. The tree is plentifully provided with narrow, lance-shaped, rich green leaves and the fruit is globose, plum-like, orange-brown, somewhat bloomy when ripe and about $\frac{1}{2}$ an inch in diameter. The wood is light, yellowish white, close grained, elastic, free from knots and not resinous. It saws easily, planes to a smooth surface and takes nails well. It is not durable for external work where exposed to the weather but for furniture, paneling, flooring, joinery, pattern making and interior construction generally it is a most useful and valuable wood. When air-dried planks have a tendency to warp but kiln-seasoning gives excellent results.

The species belongs to the Nagi section of the genus. It is a light demanding tree and flourishes best in cool rich forest soils. It enjoys the wind protection afforded by lesser trees and when out in the open or when fully exposed to the wind it is less tall and inclined to have an irregular, even scrawny, crown.

A superior wood is that of *P. latifolia* R. Br., the Real Yellow-wood or Regte Geelhout of the Dutch, which grows in forests along with *P. falcata* R. Br. The Real Yellow-wood has fibrous bark and belongs to the section of the genus that has the fruit seated on a very pronounced arillode and of which the Japanese *P. macrophylla* D. Don. is a known example. This is not so large neither is it so handsome a tree as *P. falcata* R. Br., but its wood is, perhaps, superior to that of any other African species.

TWO NEW BAMBOOS FROM NEW GUINEA

AIMÉE CAMUS

Schizostachyum Brassii, n. sp.

Culmi 3-4.5 cm. alti, fistulosi, glabri, recurvati. Foliorum lamina lanceolata, basi rotundata, apice setaceo-acuminata acumine scabro, pallida, glabra, basi puberula, 15-40 cm. longa, 4.5-5.8 cm. lata, margine scabra, superne scabrido-ciliata, nervis permultis parallelis bene striata, venulis transversis tessellata; petiolus crassus, 4-6 mm. longus; vagina striata, superne truncata, ore ciliato-setosa; ligula truncata, ciliata. Panícula depauperata, elongata, foliata; rami puberuli; bractee ovatae, mucronatae; spiculae angustae, lineari-fusiformes, subteretes, 15 mm. longae, uniflorae; rachilla supra glumam floriferam producta et glumam sterilem cum palea procreans; glumae steriles 3, prima 4-6 mm. longa, ovato-lanceolata, mucronata vel subaristata, 7-9-nervia, margine pilosa; secunda 5-8 mm. longa, ovato-lanceolata, mucronata, subaristata, 7-9-nervia, superne pilosula, margine pilosa; tertia 8-9 mm. longa, ovato-lanceolata, subaristata, 7-nervia; gluma fertilis expansa ovata, mucronata, subaristata, 8 mm. longa, glabra, superne pilosa, 9-11-nervia; palea oblonga, 7-8 mm. longa,

truncatula, breviter bidentula; lodiculæ lanceolatae, margine ciliatae; stamina 6, filamentis conjunctis sed cito separandis; antherae lineares, 2.5–3 mm. longae, luteolae, apice subacutae, glabrae; ovarium glabrum, stylo longo; stigmata 3, plumosa. Fructus elongatus, superne attenuatus, pilosus; flos superior: gluma ovata, mucronata, 7–8 mm. longa, margine ciliata, 5-nervia; palea 3–5 mm. longa, oblonga, subcarinata, apice bidentata, ciliata.

NEW GUINEA: Ihu, Vailala River, *L. J. Brass*, no. 1105, March 4, 1926.

This species is called BE-ERO by the natives.

The fertile flower is surmounted by a sterile flower situated at the end of an articulation of the rachilla which is 2 mm. long, slender, glabrous, slightly dilated and ciliate at the apex. Above this flower at the end of a very short articulation of the rachilla appears sometimes a second shorter and more rudimentary sterile flower.

Though the filaments in a young state have a tendency to unite, this species recedes from the genus *Neohouzeaua* by the presence of one or two upper sterile flowers and of a rudiment of a keel in the palea of the fertile flower and thus approaches *S. Blumei* Nees, the type species of the genus *Schizostachyum*. The tendency toward a union of the very young filaments is also found in *S. Hallieri* Gamble. By this character and by the ciliate apex of the sheaths with the setae about 6 mm. long *S. Brassii* approaches *S. Hallieri* but differs in the arrangement of the inflorescence, in the less congested spikelets, the shorter bracts, in the sterile and fertile glumes distinctly hairy on the margins and with a longer mucro, in the truncate and bidentate palea of the fertile flower and finally in the leaves being more rounded at the base. From *S. Blumei* it differs in the yellow anthers, in the arrangement of the inflorescence, the less hairy glumes with a shorter mucro. In its leaves *S. Brassii* somewhat recalls *S. latifolium* Gamble, but differs in its very loose inflorescence, which is a much-branched panicle, in the scarcely bidentate palea of the fertile flower and in the glabrous anthers. It resembles *S. chilanthum* Kurz in the slightly 2-keeled palea and in the presence of an upper sterile flower, but differs in the arrangement of the inflorescence, in the ciliate glumes and in the not bicuspidate palea.

Bambusa Brassii, n. sp.

Frutex scandens; culmi glabri, fistulosi. Foliorum lamina subelliptica, basi attenuata, petiolata, apice acuminata, 22–25 cm. longa, 5–6 cm. lata, glabra, versus apicem scabra, margine scaberula, nervis parallelis multis striata; petiolus 4–5 mm. longus; vagina glabra, striata; ligula truncata, glabra. Inflorescentia elongata, spicularum fasciculi alternantes satis distantes, densi, sed parvi; spiculae glabrae, 0.8–1 cm. longae, 3–4-florae; glumae steriles ovato-acutae, plurinerviae; glumae fertiles ovato-acutae, mucronatae, inferiores 5–5.2 mm. longae, glabrae, apice puberulae, 11-nerviae; palea glumam subaequans, ad carinas inflexa, dorso inter carinas parum concava, superne puberula; lodiculæ ovatae vel oblongae, hyalinae;

stamina 6, libera; antherae 1.8–2 mm. longae, luteae, glabrae, apice mucronatae; ovarium oblongum, basi attenuatum, superne pilosum; stylus pilosus. Fructus?

NEW GUINEA: foothill forests, Borabere, alt. 360 m., *L. J. Brass*, no. 715, Nov. 30, 1925.

This species is called LINOÓ by the natives.

In the arrangement of its inflorescence this species recalls *B. Griffithiana* Munro, but differs in the more numerous flowers of the spikelets, in the mucronulate anthers, elongated style, the hairy apex of the ovary and finally in its sheaths and ligulae being glabrous at least in the fully developed leaves. It also resembles *B. Thorelii* G. Camus in the arrangement of the inflorescence, but the leaves are much larger, have 9–10 pairs of secondary veins with numerous intermediary veins, and are somewhat tessellate.

SOME NONDESCRIPT PIPERS FROM NEW GUINEA.

WILLIAM TRELEASE

THE following species form part of a collection of woody plants made in New Guinea in 1926–27 by Mr. L. J. Brass for the Arnold Arboretum. Ninety-three species of Pipers have been recorded for New Guinea and the adjacent Bismarck Archipelago and the eleven here described bring the number up to 104. It is not impossible that one or another of these may have been reported heretofore under the name of a non-endemic species; but as I have not seen these collections I am unable to indicate synonymy for any of the present list, though they cannot be reconciled with the characters on which such species rests.

The favorable location of New Guinea, with a diversified area of some 200,000 square miles (twice that of the West Indies and nearly equaling that of Central America) makes it probable that a much larger number of Piperaceae (*Piper* 104; *Peperomia* 22; *Macropiper* 2) may be expected than is now known; and except for the few that have been cultivated, they may be expected to be endemic.

Piper (Eupiper) *arbuscula*, n. sp.

An essentially glabrous compact small tree, 10–12 ft. tall; flowering internodes slender and somewhat elongated; leaves round-ovate, abruptly sharp-acuminate, slightly obliquely cordate, 12–14 × 15–16 cm., multiple-nerved, with about 6 lateral nerves from the base and the midrib with 2 alternate branches from its lower fifth, papery, minutely dark-punctulate beneath; petiole 15–20 mm. long, approximately equaling the open sinus, exceptionally somewhat hirtellous, not winged; pistillate spikes opposite the leaves, curved, 4 × 60 mm., closely flowered; peduncle 5 mm. long, bracts round-peltate; berries orange, ovoid, pointed; stigmas 3, small, sessile.

TYPE LOCALITY: young forest, U-uma river, *L. J. Brass*, no. 1449, May 18, 1926. — Called Boni.

DISTRIBUTION: New Guinea.

Piper (Eupiper) Brassii, n. sp.

A slender nodose glabrous liana, drying dark; flowering internodes $2 \times 20-35$ mm.; leaves lanceolate, lance-oblong, or the lower lance-ovate, attenuate, acute-based, 3 or $3.5-4.5 \times 10-12$ cm., palmately 5-nerved, the nerves impressed above and salient beneath with numerous ascending cross-veins, chartaceous and glossy; petiole about 5 mm. long, neither channelled nor winged; spikes opposite the leaves, slender and long (becoming 2×200 mm.) densely flowered; peduncle 20-30 mm. long; bracts round-peltate; fruit unknown.

TYPE LOCALITY: Iawarere, at 350 m. alt., in the foothill forest, *L. J. Brass*, no. 683, Nov. 24, 1925.

DISTRIBUTION: New Guinea.

Piper (Eupiper) corylistachyopse, n. sp.

A climbing shrub; flowering internodes thick (5 mm.) and short, dingy-velvety; leaves oblong, sharp-acuminate, rounded at base or minutely cordulate, with one side barely perceptibly shorter, $4.5-7 \times 14-19$ cm., pinnately nerved from below about the middle, the nerves 5 or 6×2 gradually congested downwards, drying dull and papery, dingy-velvety beneath; petiole $10 + 1$ mm. long, velvety, channelled, sheathing below; pistillate spikes opposite the leaves, $5 \times 20-30$ mm., densely flowered; peduncle stout, recurving, 10-15 mm. long; bracts round-peltate; ovary sessile; stigmas 3, linear, sessile.

TYPE LOCALITY: rain-forest, Sogeri, at 450 m. alt., *L. J. Brass*, no. 655, Nov. 17, 1925.

DISTRIBUTION: New Guinea.

Piper (Eupiper) flavifructum, n. sp.

A somewhat nodose fleshy scandent or straggling shrub; leaves broadly ovate, acuminate, shallowly (or the lower moderately deeply) cordate, slightly oblique, $7 \times 13-11 \times 16$ cm., multiple-nerved from the basal 10 or 15 mm., the 7 nerves sparsely hirtellous beneath, dark green, drying thin; petioles 10 or on the lower leaves 30 mm. long, channelled but not winged, somewhat puberulent; pistillate spikes opposite the leaves, in fruit 20×50 mm., loosely flowered; peduncle about 20 mm. long, at most locally and obscurely puberulent; bracts round-peltate; berries yellow, pyriform, stipitate for an equal length, glabrous; stigmas 3, sessile, short.

TYPE LOCALITY: swampy rain-forest on the Domara River, *L. J. Brass*, no. 1644, June 4, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) fragrans, n. sp.

A somewhat succulent nodose glabrous shrub, decumbent, and rooting from some nodes; flowering internodes rather slender and short ($2 \times 15-25$ mm.), finely striate; leaves ovate, acuminate, round-based, $4.5 \times 8-5.5 \times$

11 cm., sub-pinnately nerved with 3 pairs of strong nerves from the lower fourth and a fainter pair from the upper fourth, drying thin; petiole about 5 mm. long, channelled but not winged; spikes opposite the leaves, as yet 1.5×40 mm.; peduncle 5 mm. long; bracts round-peltate; flowers said to be very sweet-scented.

TYPE LOCALITY: Iawarere, at 550 m. alt., *L. J. Brass*, no. 701, Nov. 25, 1925.

DISTRIBUTION: New Guinea.

Piper (Eupiper) Melula, n. sp.

A high-climbing somewhat nodose glabrous shrub; flowering internodes moderately slender and elongated; leaves inequilaterally round-ovate; abruptly very short-acuminate, rounded at base, 6×9 – 11×12 cm., septuplinerved from within the lowest 10 mm., the midrib with a single upcurved branch one-fourth from the apex, drying thin-papery; petiole 10–15 mm. long, channelled, sheathing toward the base or the longer up to the middle; spikes opposite the leaves, as yet 2 – 3×60 mm., closely flowered, green; peduncle slender, 5 mm. long; bracts round-peltate.

TYPE LOCALITY: rain-forest, Hewa, Vaitata River, *L. J. Brass*, no. 1130, March 13, 1926. — Called Melula.

DISTRIBUTION: New Guinea.

Piper (Eupiper) morianum, n. sp.

A large glabrous nodose succulent climbing shrub; flowering internodes moderately slender and short; leaves elongated-ovate and obscurely cordulate above, broadly ovate and very shallowly cordate below, acuminate, slightly inequilateral, 5×11 , 7×15 , or 11×17 cm., palmately 5- or 7-nerved, chartaceous; petiole 10 mm. long, openly grooved, sheathing toward the base; spikes opposite the leaves (young) scarcely 2×40 mm., closely flowered, in fruit said to be long and red; peduncle slender, 20 mm. long; bracts round-peltate.

TYPE LOCALITY: rain-forest, lower Mori River, *L. J. Brass*, no. 1562, May 28, 1926. — Called Boidiboro.

DISTRIBUTION: New Guinea.

Piper (Eupiper) pavimentifolium, n. sp.

A low-climbing somewhat fleshy shrub; flowering internodes 5×100 –150 mm., harsh, subvillous; leaves lance-elliptic, sub-acuminately pointed, the slightly inequilateral cordulate base equally contracted, 10 – 11×25 cm., pinnately about 11-nerved from the lower third, the nerves and cross-veins impressed above and very salient beneath, hard, stiffly hirtous beneath; petiole 10 mm. long, harshly subvillous, channelled, sheathing only at base; pistillate spikes opposite the leaves, 5×60 mm., densely flowered, peduncle 10 mm. long, sparsely hirsute; bracts round-peltate; berries immersed in the rachis, globose; reddish-yellow; stigmas about 3, sessile, broad.

TYPE LOCALITY: rain forest on the Murua River, at 100 m. alt., *L. J. Brass*, no. 1338, March 29, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) *pullibaccum*, n. sp.

A weak zig-zag softly pubescent undershrub; flowering internodes moderately slender and short, villous; leaves ovate, acuminate, obliquely cordate, 6×10 – 10×16 cm., submultiple-nerved from the lower third, the nerves 4 or 5×2 , somewhat transiently short-pubescent above with hirtellous nerves, crisply subvillous beneath, drying thin; petiole about 10 mm. long, about equaling the sinus, sheathing for some distance above the base; pistillate spikes in fruit about 10×100 mm., closely flowered; peduncle slender, 15 mm. long, villous; bracts round-peltate; berries brown, ellipsoid, narrowed at base rather than stipitate; stigmas 3, linear, recurved, small.

TYPE LOCALITY: edge of rain-forest, Vaitata River, *L. J. Brass*, no. 966, Feb. 13, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) *rhizocaula*, n. sp.

A large glabrous climbing shrub, abundantly rooting from the nodes; internodes rather thick and elongated, angular and striate, concolorously verruculose; leaves round-ovate, abruptly and obtusely short-acuminate, 14×16 – 19×30 cm., round-based, the minutely cordulate margin sometimes connate across the petiole, multiple-nerved, with 6 nearly based lateral nerves and the midrib 2-branched one-third above the base, drying rather thin and cellular-pale-punctulate beneath; petiole 10–15 cm. long, winged toward the base; fruit said to be red.

TYPE LOCALITY: rain-forest at Kira, Vaitata river, *L. J. Brass*, no. 1115, March 9, 1926.

DISTRIBUTION: New Guinea.

Piper (Eupiper) *rhodocarpum*, n. sp.

A sparsely hirtellous nodose rambling shrub; flowering internodes moderately slender and elongated, sparingly hirtellous; leaves elliptic or subovate-elliptic, acuminate, obtuse or subacute at base, 7.5 – 13×15 – 22 cm., submultiple-nerved from the lower half or third, the nerves about 3×2 , at most slightly hirtellous beneath, drying thin; petiole 10–20 mm. long, transiently velvety, scarcely channelled or sheathing; pistillate spikes opposite the leaves, in fruit 10×35 mm., very closely flowered; peduncle 10 mm. long, hirtellous; bracts round-peltate, concave and crisped; berries bright red, with a stout style; stigmas 2.

TYPE LOCALITY: rain-forest on the U-uma river, at 150 m. alt., *L. J. Brass*, no. 1427, May 14, 1926. — Called O-o-o.

DISTRIBUTION: New Guinea.

Piper (Eupiper) viridibaccum, n. sp.

A slender nodose climbing shrub; flowering internodes rather short, crisp-pubescent in lines; leaves oblanceolate-subobovate, sharply acuminate, the narrowed base somewhat inequilaterally cordate, $6-8 \times 15-17$ cm., submultiple-nerved from the lower fourth, the larger nerves 4×2 , drying thin, the nerves finely crisp-pubescent beneath; petiole about 5 mm. long, shorter than the auricles, crisp-pubescent, scarcely sheathing; pistillate spikes opposite the leaves, $4-5 \times 30$ mm., densely flowered; peduncle filiform, 80 mm. long, glabrous; bracts round-peltate; berries green, suboblong, mucronately contracted; stigmas 2.

TYPE LOCALITY: rain-forest, Mowabula, *L. J. Brass*, no. 1370, May 10, 1926.

DISTRIBUTION: New Guinea.

ADDITIONS TO THE KNOWLEDGE OF CHINESE TREES, I

WOON-YOUNG CHUN

Castanopsis Greenii, sp. nov.

Arbor 18-metralis, cortice fusco vel cinereo, in lamellas irregulares oblongas detergentes fisso; ramuli graciles, glabri, teretes, viridi-brunnei, vetustiores nigricantes; gemmae obtusae, perulis fuscis extus adpresse pilosis. Folia persistentia, coriacea, graciliter petiolata, integra, glabra, lanceolata vel elliptico-lanceolata, breviter acuminata, apice obtusa vel acutiuscula, basi subinaequilateralia, breviter cuneata, in petiolum breviter decurrentia, 5-10 (-15) cm. longa, 1.5-3.5 (-5) cm. lata, supra laete viridia, subtus opaca, pallida, obsolete reticulata, costa supra plana, subtus elevata, nervis lateralibus utrinsecus 8-10, sub angulo circiter 30° a costa divergentibus utrinque vix prominulis ante marginem anastomosantibus; petioli graciles, supra plani, glabri, 1.5-2.5 cm. longi. Amenta mascula ad basin innovationum pluria, ascendentia, ad 7 cm. longa, rachi tenuissima pilosula; flores 2-3-fasciculati; stamina 12, perianthio 5-fido circiter 2-plo longiora; ovarii rudimentum pilosum. Spicae femineae masculis fere dimidia breviores, 2-4 cm. longae, puberulae, in superiore ramuli novelli parte solitariae, in axillis foliorum juvenilium; flores pauci, sparsi, alterni. Fructus globosi, in valvas 4 aequales dehiscentes, solitarii vel bini; involucri aculeis fasciculatis acicularibus gracilibus subulatis, fere rectis brunneis densissime echinata; valvae extus cinereae, pilosulae, intus densissime sericeo-villosae, circiter 5 mm. crassae; glans solitaria, depresso-globosa, dense puberula.

Tree about 18 m. high with umbrageous, densely foliated crown about 20 m. across. Bark of trunk dark or pale gray, peeling off in irregularly oblong somewhat fibrous thick plates, the inner bark cinnamon-red. Branchlets 3-4 mm. in diameter, glabrous, terete, brownish green, sub-lustrous, minutely grayish lenticellate, becoming dark brownish black the

second year, finally changing to dull black. Stipules linear, purplish, caducous. Leaves persistent, coriaceous, slender-petioled, wholly glabrous, entire with translucent margin, lanceolate or elliptic-lanceolate, apex attenuate into an acutish or acuminate point, base subinequilateral, shortly cuneate, slightly decurrent down the petiole, 5-10 (-15) cm. long, 1.5-3.5 (-5) cm. wide, upper surface light green, lustrous, with flattened midrib, lower surface paler green, opaque and with the midrib distinctly elevated, finely but obscurely reticulated, drying grayish yellow, lateral veins 8-12, diverging at an angle of about 30 degrees from the midrib, slender and disappearing towards the margin on upper surface, slightly more distinct and confluent towards the margin beneath; petiole slender, flattened above, glabrous, 1.5-3.5 cm. long. Inflorescence from terminal and subterminal buds, spicate, ascending, the pistillate above the staminate in a pseudopanicule on a more or less purplish-red branchlet terminated by young leaves. Staminate spikes many, creamy white, to about 7 cm. long, rachis and perianth minutely puberulous; flowers in clusters of 2-3 separated by short intervals; stamens 12, slightly more than 2 times longer than the calyx; calyx 5-fid, the lobes broadly ovate, obtuse; rudimentary ovary villous; pistillate spikes solitary; flowers few, solitary, scattered; stigmas 4, linear, erect, silky-pilosulous, especially towards the base. Fruit dehiscent into 4 regular valves, solitary or 2 together, globose, about 6 cm. across before dehiscence, and about 8 cm. across when open, chestnut-brown, densely echinate with slender subulate spines branching from a common base, the peduncles densely grayish pilosulous, valves woody, about 5 mm. thick, densely silky-villous inside; nuts solitary, depressed-globose, densely tawny-tomentose, apex umbonate, base with large pale convex rugulose hilum, about 2 cm. in diameter and 1.8 cm. high.

HONGKONG: New Territory, Sha Tin, top of wooded slope back of Lek Yun village, *W. Y. Chun*, no. 4966, March 24, 1927; from the same tree, no. 4966a, June 22, 1927, no. 4966b, December 2, 1927.—Specimens in Hongkong Herbarium, Herbarium of Sun Yat Sen University, Canton, and in the Arnold Arboretum.

Easily distinguished from all known Chinese species of *Castanopsis* by the lanceolate or elliptic-lanceolate, entire, long-petiolate leaves, glabrous and concolorous on both surfaces, and by the large globose, densely echinate fruit splitting open into 4 regular valves when mature and containing a solitary seed.

This species is dedicated to Mr. H. Green, Superintendent of the Botanical and Forestry Department, Hongkong, in appreciation of his courtesy in extending to me every facility for study in the Hongkong Herbarium.

Lithocarpus elaeagnifolia (Seemen), comb. nov.

Quercus elaeagnifolia Seemen in Bot. Jahrb. XXIII. beibl. LVII. 51 (1897).—Merrill in Lingnam Sci. Jour. v. 60 (1927)

Additional description:

Fruit on a spike to 10 cm. long, rarely 3 together on a stout rachis,

approximated, connate at their bases, ovoid to subglobose; cup wholly enclosing the nut, bur-like, thin, fragile, puberulous outside, silky-hirsutulous inside, the scales about 10-seriate, sparse, bases confluent, apices free, divergent, triangular-subulate, terminated by a hooked, incurved prickle, the apical scales abruptly smaller, lanceolate, closely appressed; acorn ovoid, about 18 mm. high, about as broad, chestnut-brown, apex flattened and shortly umbonate, basal scar convex, large, pale-colored, rugose.

HAINAN.

KWANGTUNG: North River Region, Tai Ping, *W. Y. Chun*, no. 5665, Dec. 11, 1927.

Lithocarpus silvicularum (Hance), comb. nov.

Quercus silvicularum Hance in Jour. Bot. xxii. 229 (1884).—Merrill in Lingnam Sci. Jour. v. 61 (1927).

Additional description:

Tree to 30 m. high, trunk 100 cm. in diameter; branchlets angled, sulcate, fuscous, puberulous, lenticellate. Leaves long-petiolate, subcoriaceous, glabrous, entire, elliptic to elliptic-oblong, caudate-acuminate, base obliquely obtuse, decurrent down the petiole, upper surface light green, sublustrous, lower surface whitish green, becoming brownish when dry, midrib flattened above, elevated on the lower surface, lateral veins 8–11 pairs, slender, diverging at an angle of about 45 degrees, ascending-curving, indistinct and with transverse veinlets above, slightly elevated and joined by transverse veinlets beneath, 7–14 cm. long, 2.5–5 cm. wide; petiole flattened above, base dilated, 2–2.8 cm. long.

HAINAN.

Lithocarpus synbalanos (Hance), comb. nov.

Quercus synbalanos Hance in Jour. Bot. xxii. 328 (1884).—Dunn & Tutchin in Kew Bull. Misc. Inform. x. 253 (1912).

Additional description:

Fruiting spike about 10 cm. long; mature fruits usually 2–3, bases connate, depressed globose; cup scales about 10-seriate, ovate-triangular, mucronate, thick, fuscous-tomentose, the uppermost scales incurved; acorn densely tawny-tomentose, top convex, apiculate.

HONGKONG: Happy Valley, *C. Ford*, July, 1880; Wong-nei-chong, *C. Ford*, April, 1881 and May, 1882. New Territory: Tai Mo Shan, May 1886. Lantau Island, *A. B. Westland*, Aug. 1888; *W. Y. Chun*, no. 4766, April 1917.

KWANGTUNG: Wan Shiu Shan, *H. Fenzl*, June, 1927.

Lithocarpus naiadarum (Hance), comb. nov.

Quercus naiadarum Hance in Jour. Bot. xxii. 227 (1884).—Skan in Jour. Linn. Soc. xxvi. 519 (1899).—Merrill in Lingnam Sci. Jour. v. 61 (1927).

HAINAN: *W. Y. Chun*, no. 999, Dec. 1919.

Lithocarpus litseifolia (Hance), comb. nov.

Quercus litseifolia Hance in Jour. Bot. xxii. 228 (1884).—Merrill in Lingnam Sci. Jour. v. 61 (1927).

HAINAN.

Lithocarpus variolosa (Franchet), comb. nov.

Quercus variolosa Franchet in Jour. de Bot. XIII. 156 (1899).—Skan in Jour. Linn. Soc. XXVI. 222 (1899).

YUNNAN: *R. P. Delavay*, nos. 1144, 3531, 3544, 4229, 4480.

Lithocarpus truncata (King) Rehder & Wilson in Sargent, Pl. Wilson.

I. 123 (1919)

Quercus truncata King in Hooker f., Fl. Brit. Ind. v. 618 (1888).

Quercus cathayana Seemen in Fedde, Rep. Sp. Nov. III. 53 (1906).

Lithocarpus cathayana (Seemen) Rehder in Jour. Arnold Arb. I. 123 (1919).

YUNNAN: *A. Henry*, no. 12, 330b (type of *Q. cathayana* Seemen).

I have seen the type of *Quercus cathayana* Seemen in the Hongkong Herbarium and have no hesitation in calling attention to its identity with King's species from India.

Quercus Blakei Skan var. *Vanioti* (Léveillé), comb. nov.

Quercus Vanioti Léveillé in Fedde, Rep. Sp. Nov. XII. 364 (1913).

Differs from *Quercus Blakei* only in the grayish tomentose under surface of the leaves.

KWEICHOW: Pin Fa, J. Cavalerie, no. 3264, April 1908.

Litsea wushanica Chun, nom. nov.

Litsea gracilepis Hemsley in Jour. Linn. Soc. XXVI. 387 (1891), non Hooker f. Fl. Brit. Ind. v. 157 (1886) from Malacca.

HUPEH: Nanto and mountains to northward, *A. Henry*, no. 2999.

SZECHUAN: north Wushan, *A. Henry*, nos. 7113, 7114.

A BOTANICAL TRIP THROUGH THE CHISOS MOUNTAINS OF TEXAS

ERNEST J. PALMER

THE Rio Grande del Norte, to use the full Mexican name of the river that forms the boundary between Texas and the republic to the south, in the more than nine hundred miles of its course from El Paso to the Gulf of Mexico has in general a direction from northwest to southeast, but in addition to innumerable small windings and turns, it describes two great arcs, the convex side of the first of which is to the south and the other to the north. If a line were drawn, as a bowstring, across the first or more western of these from the northwest corner of Presidio County, Texas, to the point where the river again turns from northeast to east in Brewster County, the territory enclosed would embrace the greater part of these two great counties, or more than 4500 square miles, an area more than half as large as that of the state of Massachusetts. This region is known in Texas as the "Big Bend Country." It is for the most part an arid rocky plain, diversified by several distinct groups of mountains. There are no streams of much importance except the river that forms the southern boundary, for, although several of the smaller streams marked on the map have well defined courses, they lack, at least at most seasons, one of the elements

which in most parts of the country is considered essential for a river—namely water. Beyond the vicinity of the railway that runs along the northern border the country is but sparsely inhabited, and except some small settlements along the river and in the vicinity of the mines there are only a few isolated ranches widely scattered over the area. It is doubtful, indeed, whether anywhere else in the United States there remains a region so remote from civilization or the beaten tracks of travel as that occupied by some of the ranches along the river. What this isolation must have been before the days of roads and automobiles can be inferred to some degree from the fact that even now a trip to and from the railroad and market requires three or four days, while to drive stock over the same distance is a matter of weeks. Feed must often be carried and water is a difficult problem on such journeys. Aside from some mining enterprises and a few cotton farms along the upper part of the river where irrigation is possible, stock raising is the only important industry and cattle, sheep and goats almost the only products. All supplies not furnished directly by this industry must be brought in over the desert from the railway in trucks or wagons.

Several isolated ranges of mountains occur in the Big Bend, all of them outliers of the great Cordilleran system, of which the Christmas, Rosillos, Chinati and Chisos groups are most important. The Chisos Mountains, on the southeastern side of the area and close to the Rio Grande, are the most remote and distinct geographically, and they are also amongst the most rugged and diverse and hence most interesting of the Texas mountains as a biotic region.

Since early in the last century when the first American and European travelers and traders began to explore this part of the Rio Grande valley accounts of the strange flora and fauna have appeared, and yet it remains today as a region but partially explored and a rich mine that returns to every new investigator a wealth of interesting facts and new discoveries.

The most important early exploration and publication dealing with the botany of the region was that of the Boundary Survey that marked the line between Mexico and the newly acquired territory of the United States after the Mexican war. In the second volume of the Report of Major Emory's Expedition, published in 1859, Dr. C. C. Parry, who accompanied the expedition along this part of the river, gives an interesting sketch of the flora and of its geographical and ecological distribution, which appears as an introduction to the botanical part of the report. The explorations of that expedition were, however, necessarily limited to a narrow strip along the river in the vicinity of the military camps. Even to a much later date and until comparatively recent years independent investigations in the region were attended with much danger and hardship, not only from the adverse physical conditions of a desert country infested by venomous reptiles and other menaces, but also from the presence or potential danger of savage Indians or bandits, who have found safe retreats in its fastnesses from which to carry on their depredations on both sides of the river.

It is not surprising, therefore, that the more remote parts of the region, and especially of the mountains, should still be comparatively unknown. But with the building of roads and the advent of the automobile and with more peaceful conditions prevailing along the border at present, better opportunities and a greater degree of safety are afforded, although the traveler who would enter the region must expect still to encounter sufficient hardship and difficulty to at least add zest to his undertaking.

Amongst those who have added to the botanical knowledge of this part of the Rio Grande valley since the time of the Boundary Survey should be mentioned Mr. G. C. Nealley, who in 1887 to 1889 made collections along the border and besides rediscovering many of the rare plants of the earlier surveys added a number of new ones to the record. More recently, expeditions of the University of Texas, under the direction of Dr. B. C. Tharp, have entered the region and done some more thorough exploring in the mountains.

It was with anticipations of interesting adventure and the hope of no less interesting results botanically that I made preparations in the spring of 1928 for a brief trip into this remote part of the country.

Through correspondence with the University of Texas I had become acquainted with Mr. Leo T. Murray, then Superintendent of Schools at Ft. Davis, and he had agreed to accompany me on the trip. In this I was most fortunate, since Mr. Murray had previously been in parts of the Chisos Mountains and had a general acquaintance with the people and with conditions in the region.

On May 21st, having fitted up a little Ford car belonging to Mr. Murray, we set out from Alpine, well supplied with provisions, camp outfit, collecting supplies, and above all with water jugs and canteens, for the journey. The road between Alpine and Marathon is very good and we covered the distance of 60 miles in about an hour and a half. Here we procured a fresh supply of gasoline and oil and took leave of civilization, for this was the last point where we expected to get supplies for some time. However, we were somewhat reassured to hear that there was a little store at Glen Spring, where we might be able to supply emergency needs.

South of Marathon the road for some miles passes through a broken and interesting country. Outcrops of white novaculite on some of the hills contrast strikingly with the brown of the plains or the verdure of the trees and shrubs that grow in the protection of the ridges. We did not stop here, however, but pushed on to Garden Spring, where we made our first halt for lunch.

The spring, which is the source of a small stream, issues from the clay banks and produces a bit of verdure and a tiny bog as it spreads out over the flat plain. Here a number of Cottonwood and Willow trees were growing. Some of the Cottonwoods (*Populus arizonica* var. *Jonesii*) were of large size and here, as about many of the other springs in this region, they serve as conspicuous land marks in an almost treeless land.

The Willow (*Salix Goodingii*) is usually also found where there is permanent moisture. Just beyond the influence of the spring the xerophytic flora held sway. *Lippia ligustrina*, *Acacia constricta* and *Mimosa biuncifera* were growing along the banks, and a little farther out *Fouquieria splendens* and various species of *Yucca* and *Opuntia* were conspicuous features of the desert landscape.

About twelve miles farther on we stopped again for a hasty inspection of the flora along a little rocky ravine that traversed the plain. Here we found the curious little Wax-plant (*Euphorbia antisiphilitica*,) from the thickly coated stems of which a wax used in the manufacture of candles and soap is obtained. The naked gray stems, erect and usually unbranched, form low mounds. The plants in the center of the groups which we observed here were about six decimeters tall, gradually diminishing in height towards the outside. A little shrub three or four decimeters tall growing on the dry banks was conspicuous on account of its purple plumose heads of flowers. This proved to be *Coldenia Greggii*, a plant of the *Boraginaceae*. Two other species, *C. conferta* and *C. tomentosa*, both of which are prostrate and barely woody, were growing near. *Mozinna sessiliflora* was in fruit, and *Leucophyllum frutescens* was just coming into bloom.

For many miles we were traveling over a flat dry country, with mountains seen in the distance on either side. The gravelly or white calcareous surface was usually destitute of any vestige of grass or herb but supported a scattered vegetation of shrubs and Cactus. Over wide areas in the more sterile parts the Creosote (*Covillea tridentata*) and the Tar-bush (*Flourensia cernua*) held undisputed sway, almost to the exclusion of all others. Both are strongly aromatic and ill-smelling, which perhaps accounts for their immunity from browsing animals, including even the not very fastidious goat. Along ravines and on the rocky and more uneven ground the flora was more varied. Here Mesquite bushes and various species of *Acacia*, *Mimosa*, *Yucca*, *Agave* and *Leucophyllum* were conspicuous, with the smaller forms of *Cacti* growing amongst and beneath them, and thus occupying in this strange flora the place of flowering herbs and grass in more favored regions. Several low or prostrate *Opuntias* were growing here, one of which (*Opuntia Schottii*?) sometimes covered several square meters with its creeping branches of small cylindric and remarkably thorny joints, forming a sort of turf, such as Dante might have pictured for the Infernal Regions. Tufts of *Mamillarias* and the deeply ridged heads of *Echinocactus horizonthalonius*, half buried in the dry earth and armed with stellate clusters of curved thorns of nail-like strength, were scattered here and there. But most abundant and conspicuous of all were the mounds of *Echinocereus mojavensis*, with their hundreds of closely crowded stems thickly beset with slender spreading white spines. Some of these groups were more than a meter in diameter and the tallest joints occupying the center were three or four decimeters in length. Some of the colonies were in bloom and the magenta-pink flowers were very showy.

The road through this section was good and although there was much of interest that we would have liked to have examined, time was pressing and we pushed on for some distance before stopping to examine and photograph an unusual *Yucca* that attracted our attention. The plants, which were growing in some abundance in a depression and along a small rocky stream, had simple or rarely branching stems one to two meters in height and thickly clothed with the reflexed dead gray leaves. This was surmounted by a dense crown, six or seven decimeters in diameter, of narrow rigid glaucous leaves, from the center of which sprung the slender stem and simple panicle of flowers, which together occupied about a third of the entire height of the plant. The leaves were much narrower and more crowded than in any of the other species of *Yucca* found here, and the plants had a very distinct and handsome appearance. This proved to be *Yucca rostrata*, a Mexican species not previously known as a native plant on this side of the Rio Grande, although Dr. Trelease reported seeing it planted along the Southern Pacific railway.

Towards evening we reached Tornillo Creek where we made camp for the night. The creek was flowing, perhaps as a result of recent rain, or it may be perennial here.

After pitching the tent and making other preparations for the night, I went down to the creek for water, but although the water was clear it was scarcely potable. As I was returning a coyote ran across the creek a little way below me, but before Murray could locate him with his gun he disappeared in the chaparral and ravines.

After breakfast the next morning we set out to explore the locality. *Acacia tortuosa* was abundant near the camp and the banks of the stream were lined in places with a growth of *Pluchea sericea*, a slender shrub one to two meters tall with pink or lavender flowers, and resembling somewhat in its habit of growth the Sand Bar Willow along northern streams. On low ground along the stream were some large trees of *Salix Goodingii*, and the Mesquite and Screw Bean (*Prosopis juliflora* and *P. pubescens*) were common in somewhat dryer ground. *Opuntia Engelmannii*, *O. arborescens*, *O. leptocaulis*, *Acacia biuncifera* and several other spiny shrubs formed impenetrable thickets in places, and large patches of *Opuntia Schottii* occupied open spaces. *Acacia occidentalis*, growing on the rocky slopes, had both flowers and young fruit. On the way back we killed a small rattlesnake, which was only about three decimeters in length and of a gray or stone color faintly mottled with brown, and not easily distinguishable from the similarly colored rocks and soil of the plain.

About nine o'clock we were again on our way southward. After going a few miles we stopped along another creek, or perhaps a branch of the one we had camped by; and here the Desert Willow (*Chilopsis linearis*) was in full bloom on the gravel bars, and near-by some tall shrubs of *Leucophyllum frutescens* were also loaded with a profusion of large pink blossoms, delicately marked with brown, purple and white blotches within the pubescent

corollas. A tall Composite shrub, with yellow flowers, somewhat resembling those of a *Coreopsis*, was also conspicuous. Some of the plants were fully two meters in height. Upon examination I found that it was *Gym-nolomia tenuifolia*, although I have never seen it growing so tall elsewhere.

By noon we had reached a point opposite the Chisos Mountains, of which we had been getting glimpses for some distance back. Here the main group was in plain view but no details could be discerned, and the fantastic outlines of domes, peaks and spires outlined against the clear sky, as seen in the distance across the plains, presented a very curious scene. The silhouette was sharp and clear but only of a slightly deeper shade of blue than that of the sky itself, and indeed it looked more like the painted scene of some enchanted castle upon a painted background than the solid reality of granite peaks and cliffs interspersed with canyons and wooded valleys, that we knew it to be. The impression of unreality that the scene conveyed seemed to offer a significant explanation of the Indian name, which is said to signify "Ghost Mountains." At least, as the fancy struck me, I hoped that the name was not based upon a more vulgar superstition.

The day had grown very hot but there was no shade in sight, so we stopped by the roadside and had a hasty lunch with warm water from our canteens. Above the road on our left a rocky hillside was covered with Sotol (*Dasylirion texanum*), Lechuguilla (*Agave lecheguilla*) and other desert plants. So thickly was the ground covered with the spiny leaves of these plants that it was with difficulty we could pick our way amongst them when we went over to make photographs.

A little farther on we met a party of three horsemen returning from the river. They appeared to be stockmen or officers, but although they seemed familiar with the country they could give us little information about the localities in the mountains that we were seeking. They directed us, however, to a ranch some miles farther on and back from the main road.

The highway up to this point had been very good, being one of those constructed by the United States government to facilitate the movement of troops and supplies during the border troubles several years ago. We now turned off this road to make our way to the ranch and towards the mountains. Our first objective was Boot Spring, which we knew lay in one of the canyons back of the peaks in front of us. The reports we received at the ranch concerning the road to this locality were not very definite nor encouraging. The lady who answered our inquiries directed us to a road through the pastures which, she said, led to the foot of the mountains, where a lower camp used by the stockmen was located; there was no water there, but a trail led to a spring at the upper camp; and from that point another trail had been blazed across the mountains by a mining prospector, which, if we could find and follow it, would take us to the locality we were seeking.

The road we found ourselves on after entering the pasture was but dimly

marked and with branches leading off in various directions. Following some recent wagon tracks on one of these we started across the gradually ascending rocky plain towards the base of the mountains. The road rapidly became worse and the grade steeper and we made but slow progress. The tracks we were trying to follow proved to be a poor guide, as the driver had apparently gotten off the road and been forced to turn back more than once. Presently no sign of a road remained, or the way that had evidently once been followed had been washed out by floods from the mountains, and after going a little way in one direction we would find further progress barred by deep ditches or a surface overgrown with thorny shrubs and Cactus and too rocky to be followed. After spending several hours in this sort of travel we could get no farther, but we had now reached a point near the foot-hills of the mountains. Leaving the car here and taking with us our presses, kodaks, blankets and a small supply of provisions and water, we set out on foot to follow the road, which led up a small dry creek. This soon brought us to the stock pens of the lower camp, to which we had been directed. These were deserted, but a little farther up the canyon and nestling at the foot of the mountain was a little shack, without windows and apparently without any sort of furniture. Two young Mexican girls seemed to be the only occupants present. They seemed alarmed at our appearance, and as they did not speak or understand English, they could give us no information as to the direction of Boot Spring, but in response to our inquiries about "agua" they pointed towards the mountains.

In following the road along the side of the rocky creek we had noted the appearance of several new plants not found in the lower plain. Gregg's Ash (*Fraxinus Greggii*) was abundant on the dry banks and *Quercus Vaseyana* a little lower down. In more protected situations the Wild Cherry (*Prunus virens*) was growing and *Leucaena retusa* was in bloom in several places.

Above the camp the trail became steeper and as we were rather heavily loaded we found the going somewhat difficult. Some distance up the canyon we came upon two Mexicans, who were engaged in cutting Cedar trees, and later we met a third coming down the steep trail on a mule, which was also dragging a heavy load of Cedar poles. The muleteer seemed somewhat more intelligent than the others, but none of them could give us any information about localities in the mountains.

The flora at this level began to take on quite a different aspect, and we stopped to investigate and collect. Some of the interesting woody plants were *Juniperus pachyphloea*, *Morus microphylla*, *Garrya Lindheimeri*, *Fraxinus cuspidata*, *Lonicera albiflora* var. *dumosa* and *Acer grandidentatum*. The Maple was rather abundant locally along the bed of the stream and under protecting bluffs. It is a small tree, or sometimes shrubby, with pale bark and crooked trunks and branches. The largest specimens seen here were six or seven meters tall. There was no fruit on any of them, but it is evidently the form described by Wootton and Standley as *Acer brach-*

ypertum, and although the leaves vary greatly and some of them look quite different from those of typical *Acer grandidentatum* in other localities, it is doubtful whether the two are specifically distinct.

In a rocky basin a little farther up the mountain side there was a large colony of Poison Ivy (*Rhus bitermata*). The deeply-cut leaves of this species give it a distinct and handsome appearance. Some of the plants here were growing as upright shrubs or trailing over the rocks, while others were climbing to a height of several meters in the trees. The Wild Grape (*Vitis arizonica*) was also common here, and near by we saw the first specimens of the Cypress (*Cupressus arizonica*), which was one of the special objects of our search. The few trees seen here were of moderate size and we were unable to get fruiting specimens.

One of our chief concerns was to find water, and after searching several branches of the canyon without success we at last located the spring. A tiny streamlet was trickling from a mossy bank, and from this the water was led by an iron pipe to the concrete tank below, which furnished water for stock.

Selecting a level spot a few hundred meters above the spring we spread our blankets on a bed of leaves and Cedar boughs, and after getting supper and sitting for sometime by a huge camp fire we turned in to rest, but not until after we had enjoyed a cool bath at the stock tank. The next morning when we went down to the spring we found a large rattlesnake freshly killed, no doubt by some of the Mexicans, almost on the spot where we had disrobed in the dark on the previous night.

The Wild Cherry was common about the spring, some of the trees being 15 or 16 meters tall. On a moist bank below, a leguminous shrub, *Eysenhardtia amorphoides*, was growing, and with it a species of Dogbane, just coming into bloom. This resembled *Apocynum androsaemifolium* of the Eastern States, but proved to be *A. convallarium*. Near by I also collected *Asclepias elata* and several other herbaceous plants. The curious little Composite shrub, *Carpochaete Bigelovii* was common on rocky banks a little higher up.

After breakfast we repacked and set out to climb the mountain that rose ahead of us. There was no visible trail except for short distances where the Mexicans had dragged down Cedar logs. Some of these were so steep that it seemed impossible that even a mule could have gotten down them, had their hoof prints not been there as visible proof.

On the open slopes and ridges between the canyons many of the plants of the plains reasserted themselves and the only trees were a few scattered and stunted specimens of the Piñon (*Pinus cembroides* var. *edulis*) and of the Alligator Juniper (*Juniperus pachyphlaea*). The Gray Oak (*Quercus grisea*) was usually a low shrub, and such xerophytic species as *Cercocarpus paucidentatus*, *Mimosa biuncifera*, *Rhus trilobata*, *Condalia obovata*, *Adolphia infesta* and *Opuntia leptocaulis* were common, with Yuccas, Agaves, Nolina and Sotol scattered amongst them. Some of the Aloes or

Century-plants (*Agave applanata*) were sending up flowering stalks to a height of five or six meters, and the slender stems of the Sotol were nearly as tall. The Bear-grass (*Nolina erumpens*) was occasionally found on rocky banks and ledges, growing in large clumps with branching stems and spikes of flowers scarcely exerted beyond the protection of the rigid leaves, which were six to eight decimeters long, about a centimeter in width and with edges of almost knife-like sharpness. At this height we also began to see specimens of *Juniperus flaccida*, which is a beautiful tree with slightly pendulous branches and yellow-green drooping foliage.

When we had climbed to a considerable height and stood on top of the first ridge we were able to make a general survey of the surrounding country. Several high mountains lay ahead of us to the south and east, one of which we thought might be Mt. Emory, and another far to the right, Lost Mine Peak, but we were unable to make out from the map our exact location. Below, in the opposite direction lay the rocky plain over which we had traveled on the previous day. This was diversified by many low hills, but not a trace of civilization or human habitation could be seen. Far over the plain we could see the mountains of Mexico beyond the Rio Grande, blue and hazy on the horizon.

As this part of the mountains was as unfamiliar to Murray as to myself we decided that it would be imprudent to set out without a guide, and with our small supply of provisions and water to run the risk of getting lost in the labyrinth of canyons. Accordingly we returned to the car which we reached a little after noon.

After getting lunch and taking care of the plant collections we set out again over the difficult terrain we had traversed the day before. But this time the downgrade and our previous experience of the road proved such an advantage that we had little difficulty in getting over it and regaining the highway. There we turned south and proceeded to the settlement at Glen Spring. We found one or two white families and a number of Mexicans living there, but the place had a most dreary aspect. All of the buildings were of adobe and there was scarcely a sign of shade or vegetation to vary the grim monotony. The store proved to be a very small affair, but we were glad to be able to fill up our gasoline tank, paying forty cents per gallon for the fuel, and also to secure a few other needed supplies. At the time of the troubles with Mexico a few years ago this place was raided and robbed and several of the inhabitants were killed, by marauders from across the river. Many of the ranches in the Big Bend suffered similar depredation during the same time.

Turning back from this point we decided to go around the main group of the Chisos Mountains and to approach them from the north side. After leaving the highway we had to follow such roads as had been made through the great "pastures" for the accommodation of the few ranchers, but these we found fairly passable, although difficult to follow, and we made good time with few stops.

The vegetation was similar to that on the other side of the mountains, most of the country being without trees and with very few traces of grass or herbaceous plants, but with a scattered growth of Creosote, *Leucophyllum*, *Ephedra*, Cactus and other desert shrubs. *Koeberlinia spinosa*, sometimes called the Crown of Thorns, was frequent in places. This is usually a shrub, the naked green branches of which, thickly studded with stout thorns, form an impenetrable mass. Prairie rats and other rodents often select its base as a secure place in which to build their communal homes of earth, sticks and rubbish, and it also furnishes a favorite hiding place for rattlesnakes. Rarely it becomes a small tree; one specimen that I saw here being six or seven meters in height. Along a little dry creek bed I saw the common Mistletoe of the region (*Phoradendron Engelmannii*) growing on *Acacia Roemeriana* and *Celtis laevigata* as well as on the Mesquite, which is its commonest host. The Indian Blanket (*Castilleja lanata*) was also collected near the same spot, and it was almost the only herbaceous plant seen in bloom.

Some time after dark we arrived at an abandoned adobe house, on a ranch that was familiar ground to my companion. The two-roomed structure had a dirt floor, and the door and most of the windows were out. Our flash-lights revealed an old rusty stove without pipe, a pair of deer antlers, some feed and other supplies, including a lot of material for bee hives and part of a box of dynamite. The place did not look exactly inviting, but as a shower came up, we decided to camp inside, and accordingly we proceeded to get supper on the old stove and to spread our blankets on the floor. The chief danger was from rattlesnakes, that are likely to be found in such places, but we looked about carefully with the flash-lights and found no trace of them, nor were we molested during the night.

The next morning we had a chance to look about and explore the immediate vicinity of the ranch. We were now approaching the mountains, which were in plain view, and the rocky plain was diversified with numerous mesas and rocky ridges. A small spring issued in a ravine near the ranch house, and some Willows and Cottonwoods were growing along this and about the pond that had been constructed close by. These appeared to be of the same species which we had seen and recorded before, but this was the first place on the trip where I had seen the Button-bush (*Cephalanthus occidentalis*), which was growing with them.

There were abundant signs of Indian occupancy about some of the mesas. At one of these where we made a hasty inspection, we found remains of rough masonry walls, showing evidence of fire. These probably represented house sites. There were also a number of pot-holes cut in the rocks, some of them having a depth of five or six decimeters and a capacity of two or three gallons. Their antiquity was indicated by the fact that the slow force of erosion had served to break down some of the ledges in which they had been cut and to overturn them. The ground on

all sides was strewn with fragments of flint, chalcedony and porphyry that had been used in making arrows and other stone implements.

Turning towards the mountains after leaving this desolate camp, we followed a rather bad road to the mouth of Oak Canyon, as it is marked on the topographic map. The ranch located here had the best improvements and surroundings of any we had seen in this part of the country. The house was of frame construction and with abundant shade, being situated in a grove of *Quercus Emoryi*. Water was piped from a spring some distance up the canyon, and the same source served to irrigate a little garden and some fruit trees, which were growing under the protection of the canyon wall. We found no one about the place, so taking our packs and collecting outfit and leaving the car there, we set out up the canyon towards the mountains. Emory's Oak, Hackberry, Walnut (*Juglans rupestris*), the Mexican Mulberry and other trees were growing along the banks of the stream, and vines of the Arizona Grape were climbing in some of them. The Maidenhair Fern (*Adiantum Capillus-Veneris*) was growing on wet banks along the brook, and its delicate green fronds contrasted strangely with the dry tufts of rock Ferns, such as *Cheilanthes Eatoni*, *Notholaena bonariensis* and *Pellaea Wrightiana*, which were growing along the dry ledges a little higher up.

The ascent soon became steep and difficult as the path wound up the mountain side. Near the top the Resurrection Moss (*Selaginella lepidophylla*) was common in the clefts of the rocky cliffs. As there had been no recent rain the plants were all dry and the fronds closely coiled into tufts or balls, which suggested the significance of the name Bird's-nest Moss, by which it is also sometimes known.

At one point near the top I described a tall shrub that looked unfamiliar to me, and climbing down to it with some difficulty, I found it to be an interesting member of the Rose family, *Vauquelinia angustifolia*, a Mexican species that does not seem to have been recorded previously from this side of the Rio Grande.

We had probably ascended more than a thousand meters since leaving the ranch, and now we began a steep descent into the canyon. When we reached the bottom we found a little water running in the creek and an abundance of shade, both of which were very gratifying after the long hot climb. So we stopped here to have lunch before going farther.

At places where the canyon widened a little there was a considerable growth of both trees and shrubs. The commonest arborescent species were *Juniperus pachyphloea*, *Quercus Emoryi*, *Q. grisea*, *Q. texana* var. *chisosensis*, *Celtis reticulata*, *Morus microphylla* and *Prunus virens*. Along the canyon walls I found the little shrub, *Bouvardia triphylla*, in bloom, its clusters of bright scarlet flowers making it a conspicuous object. *Vauquelinia angustifolia* was also growing here, some of the bushes being in bloom and others with old fruit. Along the rocky bed of the creek *Fallugia paradoxa* was in bloom, and on the low banks was a shrub with brilliant

red flowers, which I found to be *Anisacanthus insignis*, of the *Acanthaceae* family.

Following up the canyon for some distance we came out upon a broad open space at the foot of the higher mountains, which surround it on three sides. This is named Green Gulch on the map, but it is generally known as the Basin. There is a scattered growth of trees and shrubs here, in which the usual species of Oak, Piñon and three species of Juniper (*Juniperus flaccida*, *J. monosperma* and *J. pachyphloea*) are most conspicuous, with Yuccas, Agaves, Nolina, Sotol, Cat-claws and other xerophytic shrubs occupying the more open and dry situations. All of the Junipers grow to a large size here and it was the only place where we found the beautiful *Juniperus flaccida* common.

After climbing one of the lower mountains, where we obtained a good view of the surrounding country, we returned through the deeper part of the canyon, this time following it down to the end, or at least as far as we could go. Below the place where we had entered we found *Pentstemon Havardi* and several other herbaceous plants in bloom. *Eysenhardtia amorphoides* was growing as a small tree six or seven meters tall, and *Clematis Simsii* was trailing along moist rocky banks. The canyon here became very narrow, and from the point where we stood there was a precipitous drop of perhaps a hundred meters or more to a lower level. The ranch from which we had started lay not more than a mile down the canyon below us, but the reason why the long detour and climb we had made to reach our present situation were necessary was now very plain. There was little or no water falling over the cliff at the time of our visit, but after a heavy rainfall it must be a rather impressive sight.

A passing shower that came up just as we reached the car gave proof that shelter is sometimes desirable even in this arid country. As there was still no one to be seen about the place we drove on some miles to the next ranch, at which Mr. Murray had stayed on a previous trip. As we drove up here we were met by a Mexican boy, who proved to be the only person about the place. However, accepting the hospitable customs of the country we went in and proceeded to make ourselves at home. The ranch house was typical of the better class of such structures in this part of the country. It consisted of two large rooms and a small kitchen and screened porch, the walls being of adobe or mud blocks and roofed with cedar poles and thatch, the whole covered thickly with adobe mud. The rough hewn or round timbers showed on the inside, but the place was not without some home-like comforts and it possessed a distinctive attractiveness peculiar to the region and to its surroundings. There was plenty of shade about the place, and water was supplied by a large open well. A large tree of *Salix taxifolia* in the yard had been transplanted, we were told, from a locality close by. The Mexican boy, Emanuel, prepared supper for us, but as he could speak no English our conversation with him was rather limited. After supper and the luxury of baths in a tub by the well we enjoyed a good night's sleep on the porch.

Early the next morning we were astir and after a hasty breakfast were soon on the way. A few miles out we stopped to inquire directions from some Mexican goat shearers who were encamped at a corral. They pointed out the road to Blue Creek and assured us that it was a "camino real" and practicable for automobiles, an optimism that our subsequent experience only partially confirmed. Our conversation was carried on partly by gestures, in which most of them were quite eloquent. There was a considerable number of men, women and children here, and the conditions under which they were living were to say the least extremely primitive. No shelter was apparent except the sheds which they shared with the goats. The green hides and the meat of some of the animals that had been slaughtered for food were hanging about and attracting great swarms of flies; and the odor from these added to the other aromas of the camp furnished a real incentive to hasten us on our way.

For some miles the road skirted the foot-hills, with some of the Chisos peaks in plain view. An intrusive dike across the plain could be traced for miles with the eye; in places it stood out as a perpendicular wall several meters in height. At one place a deer ran across the road over the open hills. It was the first we had seen, although they are said to be plentiful in the mountains.

When we reached Blue Creek we found it to be quite dry and the whole country had a parched appearance, although there was evidence of rain having fallen not long before. Near the head of the canyon there is supposed to be a small spring which we were particularly anxious to find so as to insure our water supply. However, a sharp lookout failed to discover it or any added trace of verdure that would indicate its presence. As the canyon was rapidly getting narrower and the road rougher and steeper we made slow progress and at last could go no further with the car; and so leaving it by the roadside we prepared our packs to continue the journey on foot.

Just then I descried a burro, with a little wooden saddle, such as is sometimes used by the Mexican peones, grazing in the chaparral, and on approaching we found that it had a mate similarly accoutred, and soon we saw the riders. An old man with an unusual abundance of white hair and whiskers and a little girl about eight or nine years old were the oddly assorted pair. They were having breakfast of black bread and water, and seemed to be traveling with no other outfit than a small tin canteen and a bundle or two not much larger than their water supply. The old man was evidently somewhat disconcerted by our appearance, but he appeared to be good natured and was very voluble in his Spanish, and interspersed his oration with frequent peals of laughter. We could make out little of what he said, but he was very positive in his negatives when we asked about water. A bundle of the green stalks of the Maguay (*Agave applanata*), freshly cut, was lying on the ground, and in answer to our questions he admitted that he was getting it to make "pouche" or mezcal, and it was perhaps

some natural uncertainty as to which of the conflicting views regarding his industry, both prevalent on this side of the river, we were likely to take, that accounted for his uneasiness.

Amused but not much wiser after this encounter we again set out up the trail to try to discover Boot Spring. We had not gone far when we met a Mexican riding a mule and driving two others loaded with packs, and a little behind him two young American geologists, also riding mules, who were returning from a reconnaissance in the mountains. It was a relief to meet someone again who could speak English and give us some definite information. We learned from them that they had camped at Boot Spring two nights previously, although not knowing the name of it; and they gave us directions about the trails over the mountains, estimating the distance to the spring at about eight miles. With this information we set out in better spirits.

A little farther up we found *Frazinus Greggii* abundant growing with *Porlieria angustifolia*, *Ungnadia speciosa*, *Forestiera neo-mexicana* and various other shrubs.

After following the steep and winding trail for several miles we came out into a pretty little mountain valley, called Laguna. The elevation here was about 2000 meters and the valley was perhaps not more than a quarter of a mile in length and about half as wide. A few groups of Piñon and Juniper were scattered about and there were some small groves of the Gray and Texas Oak along the margins; but most of the area was open and covered with tall grass, which was now all dry. After rains water evidently stands for sometime on the flat or depressed surface, which accounts for the somewhat marshy appearance of the tufted grass. The ruins of a small log cabin here was the only sign of civilization we had seen in the mountains. We learned that it had been built some years before and occupied by a man and his wife, who had kept a herd of cattle in the mountains. There seemed to be no permanent water supply near, which perhaps accounted for the abandonment of the place. Under some of the Oak trees near the cabin *Mahonia haematocarpa* (*Berberis haematocarpa* Wootton) was growing, some of the plants being in bloom.

Mt. Emory, the highest peak of the Chisos group (2400 meters or 7835 ft. high) lay just to the east of us and we skirted along its base for some distance, but we did not attempt to climb to the highest point, as we were anxious to reach the spring before nightfall. The slope we were traveling was well wooded and had more the appearance of a forest than anything we had seen in these mountains. *Quercus texana* var. *chisosensis* and *Q. grisea* were the commonest trees, with occasional Junipers, Madronas (*Arbutus texana*) and Wild Cherries. At the highest point of the pass there was an indication of a more boreal flora in the presence of such woody plants as *Rubus trivialis*, *Celastrus scandens* and *Symphoricarpos oreophilus*. A little lower down we came out upon a level strip of ground bordering a small creek, and here we were rejoiced to see the grove of Cypress trees for which we had been searching so long.

This tree (*Cupressus arizonica*) appears to be very local in the Chisos Mountains, although there are many trees of all sizes here. It is the only locality where it has been found in Texas and it is far removed from the other nearest stations in Arizona and Chihuahua.

Some of the trees here are quite large, the largest being probably over 20 meters (65 to 70 ft.) in height and with a trunk diameter of over a meter. The conical crowns are rather open, and the straight clear trunks are clothed with reddish-brown, comparatively smooth and slightly fibrous bark. In the younger specimens the crown is often slender-pyramidal and the branches slightly drooping. The leaves are eglandular and the fruit differs somewhat from that of typical specimens from other localities, being distinctly smaller and with longer and sharper horn-like bosses. In this respect it seems to be intermediate between *Cupressus arizonica* and *C. lusitanica*, some of the cones resembling those of the latter more closely than they do those of the species to which it has been referred. Further study may prove this to be a distinct variety, but I hesitate to consider it such without having a chance to compare material from a number of the trees, with this idea in mind.

Several of the Cypress trees were growing along the bed and banks of the little creek, below the terrace. One very large one was almost overhanging the spring, which we found here, and there were a number of small seedlings along the gravel bars. The spring was nothing but a stagnant pool of black water at the dry season of our visit, but although it did not look very inviting we drank of it and refilled our canteens, since water is too scarce and too important a consideration in this region for one to be overfastidious in its use. *Rhamnus Purshiana* was growing just below the spring and the Maple, Wild Cherry and Wild Grape were abundant. *Apocynum cannabinum* was also growing on the gravel bars, and I found *Asplenium resiliens* in clefts of the porphyritic rocks overhanging the spring.

As we were but poorly provided for spending the night here and were in a hurry to proceed, we decided to cut our investigations short and try to make our way back to the car. By taking a shorter cut through another pass we succeeded in doing this before nightfall, and as there were no advantages for a camp where we were we drove several miles down the canyon before stopping, some time after dark. Here we were on level ground, but we had no water except what we had brought with us, and wood was also scarce. However, we managed to make a fire from dry sticks of the Creosote-bush, and this served for making coffee as well as giving a cheerful light.

Early the next morning we were on our way down the canyon of Blue Creek; and we were now leaving the main group of the Chisos Mountains and turning towards Castellan, on the Rio Grande. The rest of the way was as unfamiliar to Murray as to myself, but the road, if it might be called such, followed the bed of the creek, and as the latter ran in the right direction we surmised that we might continue down it for the entire distance.

There was no distinct roadway except in places, the tracks of the last traveler, who may have passed over it weeks before, having been obliterated by subsequent rain; and we had to pick our way cautiously amongst the various channels and rocks.

The descent rapidly became steeper as we proceeded and the going worse. We congratulated ourselves that we were traveling with the grade, as it seemed impossible that a car could be made to go in the opposite direction. We were not without misgivings, however, as the idea occurred to us that we were burning our bridges behind us and had no definite information as to whether we were on the right way or where we were likely to come out.

As Murray drove I went ahead to pick out the way and remove rocks or fill in holes and sometimes to cut down obstructing shrubs. After several miles of such going we could distinguish no more trace of the road, and at last we came to a place where a dike of igneous rock lay across the creek bed, forming a sheer wall and a descent of several feet, quite impassible for any sort of a vehicle.

The situation was not a cheerful one. Our water supply was low; the sun was well up towards the zenith and scorching hot; there was an unsurmountable bluff on each side of us as well as the drop in front; and behind us lay the miles of loose rocky slope we had just come down with so much difficulty. Besides this we were in an almost uninhabited desert country, with our gasoline supply running low and no chance to replenish it or to secure help perhaps in a day's journey, even if we had known in which direction to seek it.

Under the circumstances we decided to camp where we were. So we made coffee and had lunch, after which I worked over my plant collections under the protection of an overhanging bluff, there being no other shade. Before I had finished this task the sun had gotten around to a point where it reached me and the heat was almost unsupportable.

However, the place was not without botanical interest, and the instinct of the scientist prevailing I made a hasty exploration. Along the low rocky bluffs *Tecoma stans* var. *angustifolia* was conspicuous with its clear yellow trumpet-like blossoms. A curious vine of the Malphigaceae, *Janusia gracilis*, and an Asclepiad, *Philibertia linearis*, were climbing over bushes, both of them being in flower. *Krameria glandulosa* was also growing along the rocky banks, and several herbaceous and shrubby plants were in bloom along the gravelly creek bed. A shrubby *Menodora*, with bright yellow flowers, was collected here, which may be an undescribed species.

Slight as the chance of getting back over the way we had come seemed to be it appeared to offer the only possibility. So we turned the car about, repacked it, and under the spur of necessity made a start. Fortunately we found a little pool of black water at the foot of the rocky barrier in the creek bed, and from this we filled the radiator and all the vessels we had.

Running all of the time in low gear and picking our way amongst rocks and shrubs and in places literally building a road as we went, we made slow progress. Over particularly bad places I would push, adding such power as I could to that of the overheated engine. Every few rods we had to stop to cool the motor, as the water in the radiator would be boiling and when the cap was removed it shot up like a geyser. The temperature in the close canyon aggravated this, as it was probably above one hundred degrees, Fahrenheit, in the shade, and there wasn't any shade. There were short stretches of gravel over which it was possible to make more speed, but we were probably not able to average more than two miles an hour. After an hour or so of this we had used up so much of the water, including part of our drinking supply, that I went back to the water hole with buckets to replenish it. To add to our difficulties we discovered that when the car was on a steep incline it was losing gasoline from a leaking valve that we could not tighten. A little way beyond the place where we stopped for me to make the trip back for water we discovered a stock tank, fed by a tiny spring, which we had not noticed on the way down. From this we were able to secure a better supply of water than we had had for two or three days. A few miles farther on we were rejoiced to see a road leading up from the creek valley to the higher plain, which was evidently the one we should have taken but had overlooked in coming down. But our troubles were not yet over. The hill was steep and about an eighth of a mile in length, and the way up was more like a ravine than a road, having a surface of loose rocks and gullies washed out by the floods of many years. Murray made several attempts at it but with the hot engine and heavy load was unable to reach the top, and each time had to back down and take a new run. Finally we decided that the only chance lay in completely unloading the car, which we did, and at last succeeded in getting it to the top. Then we proceeded to carry the heavy bundles of plants, collecting supplies, camp outfit and other things up the steep slope and reload them on the car.

It is hard to realize the relief we felt on finding ourselves out of this difficulty and once more on a comparatively level and passable road. There was still two hours or more of daylight, and we stopped a few miles farther on to explore some curious eroded pinnacles, known as the Chimneys. There was not much of botanical interest here except several sorts of Cactus, including a low-growing *Opuntia* with long black spines. The Indians had evidently used the place for a camp, the overhanging ledges of some of the mesas furnishing the only shade to be had on the treeless plain. Portions of the cliffs were covered with crude figures of men and monsters, mingled with more conventional designs, incised in the soft limestone. At another point we found the picture of a horse painted in shades of ochre, and displaying rather more skill than is usual in Indian art.

Some distance beyond the Chimneys we descried the welcome sight of a group of Cottonwood trees to the left of the road. In this part of the

country Cottonwoods and Willows are a certain sign of the presence of water; and we hastened to reach them and make camp for the night. It proved to be the best spring we had found on the trip, and the small clear stream that was issuing from a clay and gravel bank not only furnished us with a supply for our canteens and other camp needs, but we were also able to use one of the deep pools some distance below for a bath tub, a luxury that went far towards compensating for the hardships of the day. The only serious drawback that we found at this camp was the swarms of ants that invaded it. But we were not in a humor to be critical about little things; so we did not regard them too seriously, nor even the visit of a snake of a harmless species, that came to investigate our dinner table.

The Cottonwoods about the spring were of the same species that we had seen elsewhere, and there was little else in the way of tree growth. On the higher ground close along the stream thickets of Mesquite and several of the other spiny shrubs of the region occurred, but there was nothing worthy of note. The herbaceous growth about the spring was very sparse, the most conspicuous plant being *Samolus ebracteatus*. A little farther down on the rocky plain the Screw-bean (*Prosopis pubescens*) was growing, and under it the tiny little shrub, *Ruellia Parryi*, and an herbaceous Crucifer, *Dithyrea Wislizeni*, were blooming.

Somewhat reluctantly leaving this camp we set out the next morning for Castellan, which we reached about nine o'clock on Sunday morning. This little settlement was formerly called St. Helena, and during the border troubles a considerable body of troops was stationed here. The remains of barracks and stables are still to be seen and one of the more substantial adobe buildings erected at that time is now occupied by the general store, where a considerable stock of merchandise is carried to supply the scattered ranchers and the Mexicans from both sides of the river. The store was open and doing a brisk business and we were able to fill up our gasoline tank and make other purchases. During our strenuous experience of the previous day neither of us had dared to investigate the fuel supply, but we were not surprised now to find that scarcely an inch of gasoline remained in the tank.

As we planned to visit the Grand Canyon some miles away over a rather bad road, we unloaded our heavier packages at the store. The road led through the valley and over low hills, most of the country being bare or with a scanty growth of Mesquite and Cactus. Close along the river banks there were sometimes a few Cottonwoods or Willows or patches of *Baccharis glutinosa*, but generally there was little or no tree growth even there.

The canyon is rather impressive where we entered it at the south end. The almost perpendicular cliffs rise on either side to a height of 600 meters or more, and they are much higher in parts of the canyon. The river makes a sharp turn as it breaks through the rocky barrier and flows along the foot of the cliff, which is on the Mexican side. In the opposite direc-

tion the high bluffs extend for a long distance along a little creek, which perhaps occupies a former bed of the river. The canyon, which is several miles in length, has been cut through the massive beds of the Edwards limestone, a formation of the Comanchean series. In places it is very narrow and the walls are often perpendicular or overhanging. At places great detached masses that have fallen from above are piled up at the base of the cliffs or stand out in the channel of the river, and the swift flowing stream dashes against them in its impetuous course. There was scarcely any woody growth in the canyon except a few of the common shrubs of the plains on the higher benches. This is perhaps due to the destructive force of the great floods that must sweep through it when the river is high. We were only able to penetrate it for about half a mile before we found further passage blocked by the swift current impinging against the foot of the bare cliff.

After lunch we took a swim in the river and then drove several miles to another locality, which has been the subject of some controversy. It is generally known as the Petrified Forest, and the proposition has been made to set it aside as a state park. There is evidence of former volcanic activity here on all sides. The most conspicuous object is a small mountain, the walls of which are in places stained and streaked with colors almost as brilliant as those of a Navajo blanket. In striking contrast to this a light chalk-like deposit forms the truncate summit of the peak. The lower slopes are covered with lava, and the whole hill has the appearance of a volcanic crater, which after becoming extinct may have had a small lake in the center in which the light-colored stratified material was deposited.

On the slopes of a somewhat lower hill nearby are the peculiar formations that have given rise to the theory of a petrified forest. Several of the supposed tree trunks lie prostrate, one of which has a length of several hundred feet and a diameter of perhaps thirty feet. Another that is standing upright appeared to be thirty or forty feet tall, and there are "stumps" of several others. The silicious material of which these columns are composed has a coarse fibrous structure and a somewhat ligneous appearance. However, they are probably of purely mechanical origin, and may have been cores of mineral matter forced up through chimneys in the old volcanic floor, which having later been removed by erosion left the harder material standing out in relief. Whatever its geologic history the locality is a most interesting one. Chalcedony, agates and other silicious minerals are abundant and there is evidence of copper in the green stains of some of the rocks.

On returning to the store at Castellan we met a representative of the State Agricultural Experiment Service. There is a station here where an investigation of the native Malvaceous plants is being made at present, to ascertain whether any of them act as hosts to the pink boll worm, which is a serious menace to the cotton crop in southern Texas. Pressure of time and other plans forced us to decline an invitation for a longer stay at the station, and we hastened on towards Terlinguas.

The village of Terlinguas, occupied by the Mexican workers in the quicksilver mines, was a most curious and interesting sight, and we had to rub our eyes to convince ourselves that we were not amongst the natives of some primitive foreign clime. The low flat-topped huts, composed mostly of upright poles, mud and thatch, are scattered about promiscuously among the pens of goats and burrows, which useful domestic animals seem almost as numerous as the progeny of the dusky human inhabitants.

That night we camped on Terlinguas Creek, about ten miles from the village, where a little water, unfit for drinking purposes, was found. There were some Cottonwood trees of the usual variety near the creek, and we at first planned to pitch our tent under these, but swarms of little red ants that infested the place drove us away. After trying several places we at length spread our tarpaulin and blankets in an open space that seemed to be comparatively free from the pests, but no sooner were we located than they seemed to spring up from the dust, and we had little peace from them through the night.

We planned to reach Alpine the next day and the roads being good it was an easy drive of only a few hours. The country through which we were passing was comparatively level but with low hills and ridges at intervals and several groups of mountains visible in the distance. We climbed a high bluff along one of the streams to a rock shelter once occupied by the Indians. In the dry rubbish strewn over the floor we succeeded in uncovering fragments of rope and basketware made from leaves of *Nolina* and the fiber of the Maguay. We also found several cobs of the primitive corn raised by the Indians. These were not more than six or seven centimeters in length, and they showed evidence of having had five or six rows of grains.

Along the rocky wall just below the cave several shrubs were growing, amongst which were *Cowania ericaefolia* and *Buddleia marrubifolia*, both of which were in bloom.

A little farther on we found *Acacia occidentalis* and *A. Schottii* growing as low shrubs along rocky hillsides. The curious little Star Cactus, *Ariocarpus fissuratus*, was also growing here, the plants being almost buried in the dry calcareous soil. Shark teeth and other fossils collected on an eroded hillside near here indicated that the formation was of Upper Cretaceous age.

We arrived at Alpine shortly after noon, our car loaded to capacity with the spoils of the trip, which while representing only a small part of the flora of the Chisos Mountains and of the Big Bend, embraced at least most of the woody plants, including a number that are rare and little known.

The geographical position of the Chisos Mountains and of the Big Bend area in which they lie is one of the factors which contribute toward making the country one of the most peculiar and interesting botanical regions in the United States. For while it does not extend so far south by three degrees of latitude as does the extremity of the lower valley near Browns-

ville, it nevertheless is the most southern part of western Texas and of the entire arid southwestern part of the country, and the salient which it occupies in the bend of the river carries it deep into adjacent Mexican territory on three sides, with its extremity almost as far south as the middle of Lower California. The extreme aridity of the climate, the average annual rainfall being in most parts less than fifteen inches, and the great diversity of soil and geological formation, as well as the considerable range in elevation are of course dominant factors in accounting for the varied and unusual flora. Due to the sparsity of settlement and the impossibility of agricultural improvement over nearly all of the area it remains almost entirely in a state of nature, a condition that is not likely to be changed materially for a long while, at least under any conditions that we can foresee at present. The Chisos Mountains, situated as they are near the southern extremity of the area and close to the river that forms the international boundary, are widely separated by great stretches of desert from any region of similar topography. The higher peaks of the mountains here rise from 1000 to 1800 meters above the surrounding plains, and this difference in elevation, together with the protection afforded by the deep canyons and the somewhat greater amount of moisture received in the form of showers and mist from passing clouds which they intercept, furnishes favorable habitats to many plants not found elsewhere in the United States, and to others that are known only from stations hundreds of miles away.

It is not surprising, therefore, that every expedition and all collectors who have gone into this region have been rewarded by new and interesting discoveries, and it is reasonably certain that more thorough and systematic exploration would result in many others. The inaccessibility of the region and the considerable difficulties still to be encountered in traveling through it, some of which are indicated in this narrative, make it improbable that the flora will be known in complete detail for many years to come.

LEAVES FROM A COLLECTOR'S NOTE BOOK

ERNEST J. PALMER

Page, Okla., April 14th, 1928.

While coming down the steep slopes of Rich Mountain this morning I found several shrubby specimens of *Cotinus americanus* in a rocky ravine, 75 or 80 meters above the creek valley.

This rare and interesting tree was originally discovered by Thomas Nuttall on a bluff of Grand River, or as it is now called the Neosho River, thirty or forty miles above its confluence with the Arkansas. Since that time it has turned up in a number of isolated localities in the Ozark region of Missouri and Arkansas, as well as in northern Alabama and western Texas, but so far as I know it had not been collected again in Oklahoma.

Nuttall's station is north of the Arkansas River and about 100 miles from here.

In the Ozark region the Smoke-tree seems to be limited to rocky bluffs and hills along the valleys of the Arkansas and White Rivers. It is most abundant and of the largest size on the dolomite bluffs and adjacent bald knobs along White River, where it sometimes becomes a tree ten meters or more in height and with a trunk diameter of over three decimeters. In the Arkansas River valley it grows along high sandstone bluffs, with a west or south exposure, where it was first found several years ago near Van Buren by Mr. G. M. Brown.

Houston, Texas, April 15th.

This morning I accompanied Mr. Edward Teas to his nurseries in Conroe County. The plantations are located in a clearing of typical piney woods, as it is known in this section. The soil is a fine sandy loam rather rich in humus when first cleared. The principal forest growth is Old Field Pine (*Pinus taeda*) interspersed with a large variety of deciduous trees and shrubs.

After we had inspected some of the interesting collection of trees in the nursery and admired the brilliant display of Verbenas, Bluebonnets and other bedded plants, Mr. Teas conducted us through the woods to a little bayou, where last year he discovered the Choke Cherry (*Aronia arbutifolia* f. *macrophylla*). We found several of these shrubs growing along the banks, the plants being already out of bloom but with young fruit.

This is the third station so far found in Texas for the southern form of this typically eastern American genus, and it considerably extends the westward range. The other stations are near Bland Lake, San Augustine County, where the type of the large-leaved form was found, the plants there attaining a height of from five to seven meters and being somewhat arborescent; and along the borders of a sandy bog, in the suburbs of Texarkana, just within the state line.

Sanderson, Texas, April 25th.

On several previous trips to and from western Texas I have looked eagerly down into the deep canyon of the Pecos River, where the Southern Pacific Railroad crosses it on the high bridge. The bridge is more than 330 feet above the river, and with the canyon forms one of the principal scenic features of the rather monotonous and dreary stretch of arid plain and desert between Del Rio and Alpine.

Leaving most of my outfit at Sanderson I boarded a local train yesterday morning and got off at the flag stop, known as Viaduct, on the west side of the river, where we arrived shortly after noon. My entire equipment consisted of plant press, kodak and a little knapsack, containing a light lunch and a few indispensable collecting supplies; and as the country is but sparsely inhabited and without any accommodations for travelers, I felt a slight thrill of adventure in thus plunging into the unknown. This historic

river was formerly supposed to mark the last boundary of civilization, and "the law west of the Pecos" was the law of the gun, the strong arm and Judge Lynch.

The river at this point has excavated a deep narrow canyon in the Edwards limestone, a heavily-bedded formation of the Comanchean series. The canyon walls are in most places almost perpendicular, rising to a height of from 80 to 100 meters above the bed of the river, and I went some distance below the bridge looking for a ravine or place where it would be possible to descend to the lower level. Not finding this I went back for nearly a mile along the railway, following a side canyon, before I found a place to get down into it.

The country was extremely dry and no herbaceous vegetation was apparent on the rocky plains above the canyon. The most conspicuous plants were Yuccas and Opuntias of several species, Gregg's Ash (*Fraxinus Greggii*) and the curious Candlewood or Ocotillo of the Mexicans (*Fouquieria splendens*) with its straight simple branches, two or three meters high, surmounted by a tuft of brilliant scarlet flowers, suggesting, I suppose, the popular name from a fancied resemblance to the flame of a candle. Along rocky ledges bordering the cliffs the Resurrection-plants (*Selaginella lepidophylla*) were very abundant, and there were dry tufts of several ferns, but with no sign of recent growth.

Descending with some difficulty into the canyon, which at this point was 50 or 60 feet deep, a striking change in the vegetation was apparent. There was no water in the canyon and scarcely any herbaceous growth, but a variety of trees and shrubs were flourishing, many of them being in flower or fruit. Amongst the most conspicuous were *Quercus annulata*, *Q. Vaseyana*, *Celtis reticulata*, *C. laevigata* var. *texana*, *Acacia Roemeriana*, *A. Berlandieri*, *Sophora secundiflora*, *Leucaena retusa*, *Ungnadia speciosa*, *Rhus virens*, *Forestiera neomexicana* and *Cercis reniformis*. *Lucaena* and the two species of *Acacia* bore a profusion of flowers and were hosts to many insects. The broad leaves of the Texas Red-bud (*Cercis reniformis*) were a striking contrast to the small or dissected foliage of most of the other plants, but it was by no means common. The Mexican Buckeye (*Ungnadia speciosa*) and several of the other trees and shrubs were also in bloom.

Huge detached masses and boulders of the limestone were piled up in the canyon, in places almost obstructing passage, and there were evidences in the form of drift left high on the walls and trees of the great floods that have rushed through it in times of torrential rain. *Karwinskia Humboldtiana* was abundant near the river and here also I found *Prunus minutiflora*.

Proceeding into the main canyon I passed under the high bridge and began making my way down the bank of the river, which is here lined with a dense growth of small trees and chaparral shrubs, rendering progress in places anything but easy. *Salix nigra* var. *Lindheimeri* and *Baccharis glutinosa* were abundant near the normal water line and also great clumps

of the cane-like grass, *Arundo Donax*, and the smooth-barked shrub or tree, *Nicotiana glauca*. The two last mentioned are both introduced plants, the former coming from the Old World and the latter from South America. This curious arborescent representative of the Tobacco family is thoroughly established and is abundant along the lower courses of the Pecos, the Rio Grande and other streams of southwestern Texas.

On the higher banks and talus slopes between the river and the canyon walls the shrubby growth is often dense but it varies in character according to the amount of exposure or the protection afforded. A zone of typical chaparral occupies the intermediate ground in many places. This is quite similar in composition and appearance to the growth found along the coastal plain to the south and east, but the conditions here are too arid for it to become established beyond the protected canyon. Amongst the commonest shrubs of this formation are *Celtis pallida*, *Colubrina texensis*, *Condalia obtusifolia*, *Porlieria angustifolia* and several species of *Acacia* and *Mimosa*. Farther up, on somewhat exposed rocky slopes and ledges, this association gives place to a more xerophytic one, in which *Ephedra antisiphilitica*, *Mozinna sessilifolia*, a curious little Euphorbiaceous shrub locally known as Leatherwood, the Candlewood and several species of *Opuntia* and *Yucca* are most common. Near the base of the high cliffs, that afford a measure of protection from the scorching sun, are found the Wild China-tree or Soapberry (*Sapindus Drummondii*), the Mexican Buckeye (*Ungnadia speciosa*), the evergreen Sumach (*Rhus virens*) and the Cat Brier (*Smilax Bona-nox*). In one of the small ravines below the canyon wall I also found an abundant growth of a scandent species of Poison Ivy (*Toxicodendron bitermatum* Greene), which was climbing to a height of several meters on the face of the limestone cliff and into small trees and shrubs. The deeply-cut foliage of this plant gives it a distinctive and handsome appearance. I remember having found it also, several years ago, in the canyon of Devil's River. Along the base of the bluff a little lower down a woody *Cardiospermum* was growing, but it was not yet in flower.

As the day was hot and I had not come upon a spring I was at last constrained to try the river water, which was clear and flowing, but one taste of this sufficed, as it was extremely brackish and bitter.

Before leaving Sanderson, and also from a chance acquaintance on the train, I had made inquiry and been told that there was a white family living in a ranch house near the highway bridge, some miles below the railway, and I had hoped to find lodging there for the night. Towards evening I came in sight of the bridge and little house, and here I found an old Mexican cooking supper over a camp fire. He spoke fairly good English and in answer to my inquiries he told me that the house was vacant except for some highway workers who were camping there, and with whom he was working. He gave me to understand that he was in charge of the place and said that I might stay there for the night if I wished, and he also

invited me to have supper. Seeing no alternative except sleeping out in the canyon, where, aside from the discomfort, there might have been some danger from snakes or scorpions, I readily accepted his hospitality. The meal consisted of a stew of bacon, onions and chili pepper, very hot according to the Mexican taste, with black coffee and a sort of bread in the form of cakes or thin loaves baked in a covered skillet over the camp fire. During the meal an old white man and his son joined us and a number of other Mexicans came up and camped at a little distance. To my further inquiries about lodgings the "Americano" did not at first seem as responsive or hospitably inclined as was my Mexican host, and I could not determine which of them was really in charge of the camp. The old man seemed rather suspiciously curious about my business and reason for appearing there, which perhaps was not altogether unnatural. The Mexican, however, did not seem to share this suspicion but appeared to regard it as quite natural that I should be collecting plants, and he looked over my specimens with interest, telling me the Mexican names of most of them. It is a curious fact that the ignorant American usually seems less inclined to take an interest in nature and is not so well informed regarding natural objects and places of interest in his locality as are the men of more primitive races.

After supper cigarettes and conversation soon put us on good terms, and they assigned me the best accommodations they had—an old wire cot without bedding in a screened porch of the little house. The two white men occupied an adjoining room, sleeping on the floor, and the Mexican found quarters elsewhere. I slept with a feeling of perfect security, inspired by my knowledge of the country and the people, although not with the greatest comfort. At the earliest sign of daylight we were up and soon had breakfast, consisting again of black coffee and bread with the addition of "frijoles," cooked in the Mexican fashion. Taking leave of my friends of the camp I started to walk down to the Rio Grande, which they told me was less than a mile below. As an illustration of the hospitable customs of the country, I was unable to persuade either the white men or the Mexican to accept any compensation for my lodging and meals.

Below the bridge the valley begins to widen and several additional species of trees and shrubs appear. The chaparral occupied the higher portions, and in the deeper alluvial ground *Fraxinus Berlandieriana*, *Prosopis juliflora*, *Salix nigra* var. *Lindheimeri* and a shrubby form of the Sand Bar Willow (*Salix longifolia* var. *angustissima*) were growing.

One of the most striking plants of the chaparral is the Soap-bush, as it is known in southern Texas (*Porteria angustifolia*), of the Lignum-vitae family (*Zygophyllaceae*). This was quite common in dryer situations, sometimes growing as a low shrub with stout crooked branches spreading near the ground, apparently due to a sort of pruning of the young growth by grazing animals; elsewhere it attained a height of four or five meters with numerous stout and erect stems. Some of the bushes had a profusion of the deep violet flowers and some half developed seed pods.

The mouth of the canyon is several hundred yards in width and is bounded by bold promontories that continue as a line of high bluffs along the American side of the Rio Grande. The locality is much frequented by fishermen and campers, although none were there at the time of my visit, and there were signs of a lively international trade, in the form of broken and empty bottles scattered in great quantities through the chaparral. The Mexican side of the river was low and covered in places with thickets of Willows, *Baccharis glutinosa*, *Arundo Donax* and similar growth. My friends of the road camp had warned me that there had recently been some shooting across the river, and I was somewhat wary of exposing myself there, although there probably was really little danger except to such as were engaged in contraband traffic or the excesses that grow out of it.

Going back along the east bank of the Pecos I decided to cross the river some distance above the highway bridge. This I easily accomplished by removing my boots and wading across at a shallow point, the water being nowhere more than knee deep. With some difficulty I climbed the bluffs and came out upon the highway and the dry rocky plain that it traverses. Here I took several photographs of the desert flora, of which Yuccas, Opuntias and the Candle Bush were conspicuous features. A little farther on I was overtaken by a party of fishermen, whom I had encountered in going down the river on the previous day, and I rode with them to the little station of Shumla where we enjoyed the luxury of cold drinks and lunch.

Having three or four hours to wait here for the train I spent it in exploring another deep little canyon leading down to the Rio Grande, which is less than a mile from the station. This was in all respects similar to the one I had first entered on the previous day, but it added several woody plants not seen in the former. *Bumelia texana* was growing here as a shrub less than two meters high, and all of the plants were badly infested by some insect that caused a swelling of the young branchlets where eggs were deposited. In the protection of the high perpendicular bluffs that formed the canyon walls some of the shrubs attained the dimensions of trees, although shrubby in form. Specimens of *Quercus Vaseyana* were noted fully ten meters in height and with trunks three decimeters in diameter. *Leucaena retusa* grew to a height of eight or nine meters and *Ungnadia speciosa*, *Sophora secundiflora* and *Portieria angustifolia* were fully six meters high. *Smilax Bona-nox* and *Vitis Longii* were climbing in trees and shrubs close to the canyon walls and *Porophyllum scoparium* was growing in clefts of the limestone.

Uvalde, Texas, April 30th.

This flourishing little city, one of the prettiest and most attractive in southwestern Texas, is situated near the head of the Leana River, a tributary of the Frio. It is only a small intermittent stream here, with a few water holes at intervals along its course, some of which are fed by springs that seep through the clay or gravel banks. The Nueces River

flows a few miles to the west, and although it also is often dry in part of its course, it is one of the most important rivers in this part of the state.

Today I followed the Leana for several miles below the town. A considerable tract has been set aside for a park, and this is largely in a state of nature except for the clearing away of undergrowth and the opening of roads. Live Oak and Pecan are the principal trees, with some Mesquite, Hackberry and Cedar Elm (*Ulmus crassifolia*) in the more open parts.

For some distance down the river the banks are low, with occasional bluffs only a few meters in height, cut through the soft conglomerate of the Uvalde formation, a diluvial deposit of comparatively recent geologic age. Beyond the meandering rocky bed of the stream alluvial flood plains have scarcely begun to develop. Close to the river I examined some rather large trees of *Celtis laevigata* var. *texana* and *Morus rubra*. Live Oaks overhung the banks in most places, often festooned with Grape vines (*Vitis Berlandieri*), and *Rhus Toxicodendron* and *R. rhomboidea* are common shrubs. Usually the Pecan is the most abundant tree, and it often attains a height of 15 or 20 meters. Along wet banks and the margins of water holes there are some fine beds of the Maidenhair and Shield ferns (*Adiantum Capillus-Veneris* and *Dryopteris patens*) and two species of Water Pimpernel (*Samolus floribundus* and *S. ebracteatus*). A little distance back from the stream the semi-arid vegetation holds sway, with a variety of spiny shrubs and small trees. Yuccas, Cacti, Mesquite and the Huajilla (pronounced Waheyah) are common, the last often being the dominant plant in rocky ground. It is said to furnish excellent forage for sheep and goats, and I was told by ranchmen that they attribute the superior quality of the mohair produced here to the abundance of this shrub. The fragrant flowers of this species of Acacia (*A. Berlandieri*) are also of great value to the apiarists, who have developed an industry of considerable local importance.

May 1st.

Chalk Bluff, about 14 miles northwest of Uvalde, is one of the largest bluffs in this vicinity and probably along the whole course of the Nueces River. There is no settlement or village at this point, but a club house is located near for the accommodation of campers and fishermen. The river here has cut through the horizontal beds of Comanchean limestone, which are exposed in the bluff, rising to a maximum height of perhaps more than 300 feet (100 meters) above the stream, and extending along it for nearly a quarter of a mile. The exposure is mainly towards the east. On the opposite side the strata have been broken down and removed, perhaps owing to a difference in composition due to faulting.

I had made two visits to this locality several years ago, and on the first occasion found a large Cottonwood tree, which was later taken by Professor Sargent as the type of a new species, *Populus Palmeri*. The principal object of my present visit was to try to rediscover this tree and secure additional specimens of the leaves and a sample of the wood.

Leaving Uvalde on the motor bus I arrived about two o'clock in the afternoon at a point on the highway opposite the bluff and about two miles distant from it. Making my way across the rocky plain I crossed the river, which although running swiftly was shallow and easily fordable at this point near the north end of the bluff. A number of aquatic plants were growing in a spring that issued from the gravel here, and a little lower down and along the margin of the river I found the shrubby Willow, *Salix longipes* var. *venulosa*. Below the bluff and protected by it from the scorching rays of the afternoon sun there is a narrow strip of rocky talus, usually bare near the river but with some accumulation of soil and humus higher up. This is occupied by a rather dense growth of trees and shrubs as well as many herbaceous plants, several of which are very local and out of their usual range here. Pecan and the Texas Oak (*Quercus texana*) were amongst the commonest trees, with Black Willow (*Salix nigra* var. *Lindheimeri*) growing close to the river and *Celtis reticulata* in more exposed places. The Wafer Ash (*Ptelea trifoliata* var. *mollis*) and the Spice Bush (*Benzoin aestivale*) were abundant and both were in fruit. *Rubus trivialis* was growing amongst the rocks and *Clematis Simsii* and *Vitis Berlandieri* were climbing over rocks and bushes. In clefts of the rock near the base of the cliff I found a beautiful scarlet-flowered sage (*Salvia Roemeriana*) and the little tufted shrub of the Composite family, *Laphamia Lindheimeri*.

After some search and as I was almost ready to give up the quest I saw in the distance, in the valley and beyond the south end of the bluff, a large tree standing well above the surrounding growth. From its appearance I felt sure that it was a Cottonwood and upon making my way to it I found that it was the tree I was looking for. It is growing in moist alluvial ground near a spring, just below a little bluff on the east side of the river. This tree appears to be the only one of its kind in the vicinity, but it is conspicuous for size amongst the large Pecan trees and other species that surround it. I found some difficulty in reaching the lowest branches, but finally succeeded in getting a few leaves and a small specimen of wood.

May 2nd.

When I was in Uvalde about ten years ago Mr. F. Getsendener, then the editor of a local newspaper, told me of a very large Cottonwood tree he had seen on the Nueces River a few miles from Uvalde. As trees of the genus *Populus* appear to be so rare in this vicinity I was anxious to see it, thinking it might prove to be the same as the interesting tree found at Chalk Bluff. Mr. Getsendener at that time kindly took me over to the river where he thought the tree was growing and we spent nearly half a day in searching for it, but without success. A few days ago I again met this gentleman in the Post Office here and he at once recognized me and told me that he had been waiting for a chance for these many years to make good in showing me that Cottonwood tree. Accordingly, this morning he took me over to the river in his car and after going as far as the road would permit we left it

near a ranch house and struck out down the river. The stream winds about in a tortuous course, often dividing its channel along the rocky flood plain, flanked by low banks or bluffs, beyond which is the narrow valley, open in places but elsewhere dissected with ravines and with a more or less dense growth of shrubs and trees. The going is often difficult and it is particularly hard to keep directions. Live Oak, Pecan and Hackberry are amongst the commonest forest trees, with occasional specimens or clumps of Elm (*Ulmus crassifolia*), Mulberry, Soapberry (*Sapindus Drummondii*) and Ash (*Fraxinus Berlandieriana*) and several other species. The River-bank Walnut (*Juglans rupestris*), the Desert Willow (*Chilopsis linearis*) and the Southwestern variety of the Sycamore (*Platanus occidentalis* var. *glabrata*) are characteristic species along the rocky flood plain of the present channel of the river.

After we had tramped several miles and my guide was beginning to feel discouraged we at last saw the tree we were in search of close beside the river. It was a very fine large specimen and I was quite willing to accept Mr. Getsendener's opinion, that it was the largest tree in Uvalde county. The trunk, which was somewhat flattened, was more than seven feet (two meters) in diameter, and while we did not have a chance to measure the height, I estimated that it must have exceeded one hundred feet (thirty to thirty-five meters).

On an examination of the specimens, however, I cannot see that they have the distinctive characters on which *Populus Palmeri* was based and it probably must be referred to the common and widely distributed Cottonwood of the eastern United States, *Populus balsamifera* var. *virginiana*. This species has not been known before from so far south-west in Texas.

Carrizo Springs, Texas, May 3d.

A torrential rain fell in this section yesterday and last night, and I was advised at Uvalde to take the train rather than conveyance over the highways, which was likely to be interrupted by washouts or high water. I was the only passenger on the coach of the mixed train that runs between Uvalde and Crystal City, and the conductor told me that they often made the trip without any passengers, so successful is the competition of motor busses and private cars along the recently improved roads.

The train traveled slowly enough for me to get a very fair view of the country through which we passed and of its vegetation. For several miles the country was comparatively level and covered with a sparse growth of Mesquite trees and various shrubs, amongst which were *Yucca Treculeana*, *Celtis pallida*, *Ephedra trifurca*?, *Acacia Wrightii*, *Mimosa borealis*, *Opuntia leptocaulis*, *O. Engelmannii*, *Condalia obovata*, *Colubrina texensis*, *Cercidium texanum* and *Lycium Berlandieri*. Where the surface was a little more rocky, *Acacia Berlandieri* was common. In the intervals between the widely scattered trees and tufts of spiny shrubs the ground was white and bare and with scarcely a trace of grass or other herbaceous vegeta-

tion. Such are the typical "pastures" of this part of Texas. However, after the heavy rain a rapid transformation will take place; grass will begin to spring up in the protection of the shrubs and Rain Lilies (*Cooperia Drummondii*) and a variety of other showy flowering plants will appear.

About twelve miles southwest of Uvalde we crossed the Nueces River, close to the boundary of Zavalla County. In the vicinity of the stream and along the low rocky bluffs a marked change in the character of the flora was noticeable, both in the size and variety of trees and shrubs. Pecan, Hackberry and Black Willow were as usual the commonest trees, with *Cephalanthus occidentalis* and *Baccharis glutinosa* growing abundantly along the margins of the stream. *Platanus occidentalis* var. *glabrata* and *Juglans rupestris* were growing along gravel bars of the river. On a little bluff just beyond the bridge I noticed some tall plants of *Leucophyllum* covered with a profusion of large pink flowers. This may have been *L. frutescens*, but the flowers appeared to be larger than those seen elsewhere.

As we approached Crystal City the air became redolent with the odor of onions, this being the height of the shipping season. Fields of onions, trucks and wagons loaded with onions, and many cars in the process of loading, in addition to the heaps of decaying onions dumped along the railway impressed, both upon the eye and olfactory nerves of the traveler, the importance of the industry here. The onions, principally varieties of the White Bermuda sort, are grown in fields, by aid of irrigation from artesian wells. Many hundreds of cars are shipped from this point and Carrizo Springs during the season.

May 4th.

This morning I followed the small stream, Carrizo Creek, which lies just east of the town and runs in a southwesterly direction, for several miles. Most of the land in this vicinity is of a fine deep sand, although some of the higher areas are calcareous and support a xerophytic flora of the chaparral character. A curious little relative of the Mesquite, *Prosopis cinerascens*, was growing along the railway, probably introduced from farther south. *Parkinsonia aculeata* was common in sandy fields along the creek and quite conspicuous with its abundance of yellow flowers. In open places there were acres covered with *Argemone intermedia*, or a closely related species, but with flowers varying on different plants from white through various shades of pink and rose to the deepest wine-color. The Live Oak was also common in the sands and, in places that have not been disturbed by cultivation or too close grazing, there was a rich herbaceous vegetation of peculiar plants. I photographed a large specimen of *Salix nigra* var. *Lindheimeri* along the creek and higher up *Sapindus Drummondii* and *Bumelia lanuginosa* var. *albicans* are abundant. The *Bumelia* looks very distinct from the typical form, which is common farther east, in its narrow leaves, silvery and sericeous on the under surface. In coming up the creek I dug from the sand a large mammoth tooth, which was rather badly decayed.

This afternoon I collected on the higher ground just south of the town and bordering the creek. The difference in the flora of the two areas is quite marked. The surface here is rocky with clay or gumbo soil, eroding rapidly into ravines on the slopes along the creek. Mesquite is quite abundant and is the only thing that might be called a tree. Yuccas and Opuntias are conspicuous features and there are many of the smaller Cacti, such as *Echinocereus* and *Mamillaria*, growing under the chaparral which, in places, is dense and impenetrable. Some of the characteristic species are *Rhus microphylla*, *R. trilobata*, *Cercidium floridum*, *Acacia Greggii*, *A. Wrightii*, *Condalia obovata*, *C. lycioides* and *Forestiera angustifolia*. A curious little Agave (*A. maculosa*) was in bloom in rocky places and I secured a photograph of it and of several other things.

San Antonio, Texas, May 9th.

In coming up on the railway from Carrizo Springs a few days ago, we passed through some sandy country near the boundary of Frio and Medino Counties where an interesting flora with Oaks and Hickories attracted my attention. With the purpose of exploring this locality I went down on the Laredo motor-bus this morning and got off at the little town of Moore, in northern Frio County. From this place I followed the railroad to Divine, Medino County, collecting on both sides as I went.

Quercus marilandica, *Q. stellata*, *Q. virginiana*, *Carya Buckleyi* and *Xanthoxylum Clava-Herculis* var. *fruticosum* are common arborescent species, and *Lantana Camara* and *Bernhardia myricaefolia* are growing as undershrubs. The Hickory has a somewhat different appearance from that of the species as it grows farther east, due to the fact that here the branches extend nearly to the ground. I remember finding the same tree near Fredericksburg, Gillespie County, several years ago. Both localities are very near the 99th meridian, and this appears to be about the western limit of its range.

Along the railway enclosure, where grazing is restricted and the woody plants have been cleared away, there is an abundant growth of herbaceous plants and grasses, one of the most conspicuous species being *Phlox tenuis*. Along the banks of a little stream, on ground that is flooded after rains and remains muddy for some time, I found *Marsilia macropoda* growing very luxuriantly.

Blanco, Texas, May 11th.

The village of Blanco, situated near the head of the Blanco River, in the county of the same name, is one of the oldest settlements in this part of Texas, and it has been but slightly touched by modern progress, being more than twenty miles from the nearest railroad and somewhat off the more frequented routes of travel. The mail is received from San Marcos, and I secured a passage today on the truck that renders this service to the town and also to the few rural patrons of the Post Office Department along the road. Between San Marcos and Fischer's Store, a post office and general

mercantile establishment in Comal County, the road winds through some interesting and picturesque country and over a high limestone ridge, known as the Devil's Back-bone. From the top of this ridge one can look down on either side into deep gorges several hundred feet deep, where there is an abundant growth of small trees and shrubs. *Juniperus mexicana* is abundant on the hills, and *Quercus texana* is the commonest deciduous tree. *Quercus annulata*, *Cercis reniformis* and *Bumelia monticola* are also conspicuous. *Mahonia Swaseyi* was first found by Buckley not far from here, and I collected it here also several years ago; I saw a few specimens of this rare species along the road today, with an abundance of pink fruit.

After securing lodging and getting lunch at the small hotel at Blanco I started out and followed the river down for about four miles. The river is barely flowing at this dry season and one could cross it almost anywhere without difficulty. Some of the interesting trees and shrubs seen along this part of the river are *Salix longipes* var. *venulosa*, *Ulmus americana*, *U. fulva*, *U. crassifolia*, *Celtis laevigata* var. *texana*, *Morus rubra*, *M. microphylla*, *Mahonia trifoliata*, *Crataegus Traceyi*, *Prunus mexicana*, *P. Reverchoni*, *P. serotina*, *Acacia Wrightii*, *Mimosa Lindheimeri*, *Eysenhardtia amorphoides*, *Sophora affinis*, *Dalea frutescens*, *Ptelea trifoliata*, *Rhus virens*, *R. rhomboidea*, *R. copallina* var. *lanceolata*, *Ilex decidua*, *Ungnadia speciosa*, *Aesculus discolor* var. *flavescens*, *Malus ioensis* var. *texana*, *Ceanothus ovatus*, *Condalia obovata*, *Garrya Lindheimeri*, *Cornus asperifolia*, *Arbutus texana*, *Diospyros texana*, *Fraxinus texensis*, *Forestiera pubescens*, *Callicarpa americana*, *Lonicera albiflora* and *Eupatorium ageratifolium*. This by no means complete list shows a curious mingling of species from the eastern or Carolinian and southwestern, Sonoran, floras.

May 12th.

Having a few hours this morning before starting back for San Marcos I went up the river for a distance of about three miles. In addition to many of the things mentioned yesterday I collected *Vitis monticola*, which was in full bloom and was climbing to a considerable height in trees. About a mile above the town I found a group of several large trees of *Populus balsamifera* var. *virginiana*. *Mimosa borealis* was abundant, growing as a low spreading shrub, some of the plants being in full bloom and others covered with immature fruit, probably representing a response to two rains occurring a few weeks apart.

Low bluffs occur at intervals on either side of the river; these are seldom more than eight or ten meters high and of no great length, the soft limestone strata breaking down rather rapidly under erosional agencies. There are many well preserved fossils in some of the beds and in the clay partings between them, which seem to belong to the Fredericksburg group of the Comanchean series; sometimes this is overlaid with a conglomerate deposit. These bluffs afford a habitat for a variety of woody as well as herbaceous plants, many of which are found only in their protection. Two species of Linden (*Tilia caroliniana* and *T. floridana*) are amongst the

most interesting trees of such situations, and curiously they occur usually, if not always, along bluffs of the north side of the river, or those with a south exposure. As the river usually flows at the immediate foot of the bluff, a possible explanation is that a greater amount of evaporation in such situations tends to keep the air moist and more than offsets the direct heat. *Prunus Reverchoni*, *Rhus rhomboidea*, *Ungnadia speciosa*, *Garrya Lindheimeri* and *Sambucus canadensis* also grow in the protection of the bluffs, and where there is considerable moisture or seepage water from ledges, *Rubus trivialis* is likely to be found and often a luxuriant growth of Maidenhair Fern (*Adiantum Capillus-Veneris*).

One of the highest cliffs is known as Red Bluff and it was at this point that I turned back. This bluff is quite heavily wooded and there are some deep pools of water along its base. Several Linden trees were seen on the steep rocky slopes and here also *Prunus serotina* var. *eximia* and *Ulmus fulva* were growing, with *Cornus asperifolia* and *Sambucus* near the base. On the opposite side along the margins of a deep pool were several trees of the bald Cypress (*Taxodium distichum*), another southeastern species and usually an inhabitant of swamps, which seems strangely out of place in this semi-arid region.

Big Spring, Texas, May 17th.

Heavy rains fell last night and this morning while we were on the train coming over from Sweetwater. This must have reached almost the proportions of a "cloud-burst" here, as such torrents are known in this section. When we arrived at the station it was still raining sharply and the tracks, platform and all of the surrounding low grounds were flooded.

The rain having abated this afternoon, I started west on the railway to reach the outskirts of the town, thinking that the driest way. However, I had not calculated on the extent of the flood and I had to go two or three miles before I could find a place to cross the small river that was racing down the ditches that paralleled the embankment. Finally, wading water knee-deep and making my way across a muddy flat for some distance, I managed to reach higher ground. The railway and the lower part of the town occupy a creek valley and all of this was flooded. To the west, at the point where I left the valley, there is a dry sandy plain gradually rising to a bold escarpment about a mile beyond.

Red sandy soil with considerable gravel, and probably impregnated with gypsum, as it appears to belong to the Permian formations, covers the surface of the plain. It is occupied by a shrubby flora, rather dense in places, and elsewhere with wide bare spaces in which a few herbaceous perennials struggle to maintain an existence. Characteristic shrubs are *Juniperus Pinchotii*, *Ephedra antisyphilitica*, *Mahonia trifoliata*, *Prosopis juliflora*, *Atriplex canescens*, *Mimosa fragrans*, *Covillea tridentata*, *Condalia obovata*, *Koeberlinia spinosa*, *Microrhamnus ericoides*, *Rhus microphylla* and *Opuntia leptocaulis*. *Juniperus Pinchotii* grows here as a shrub seldom more than four or five meters high. It has much the habit of *Juniperus*

monosperma, but can readily be distinguished from that species by its stouter branchlets and generally stiffer habit, even in the absence of the large copper-colored fruit. The Creosote Bush (*Covillea*) has a monopoly of some of the more sterile and flat portions but with it sometimes grows *Koeberlinia spinosa*, presenting a very curious appearance with its green naked thorny branches.

There had probably been some rain shortly before the present heavy fall, since many of the shrubs were in flower and the little yellow-flowered Rain Lily, *Atamosco texana*, *Cassia pumilio* and a few other herbaceous plants were in bloom.

On the limestone hills there was an almost complete change in the character of the flora. A shrubby growth of *Quercus Mohriana* occupied the steep slopes and ledges and base of the cliffs; *Celtis laevigata*, *Xanthoxylum Clava-Herculis* var. *fruticosum*, *Rhus trilobata*, *Ungnadia speciosa* and *Bumelia monticola* also grew here.

There is a driveway to the top of this plateau or mesa, which overlooks the town, and from which an excellent view of the latter and of the surrounding country may be had. Following this, I came down to the railroad again on the east side of the town and after wading more mud and water came out again on low calcareous hills and a mile or two farther east got into an area of deep loose sands with quite another type of vegetation.

Quercus Havardi was very common here, growing in clumps or thickets, and usually as a slender shrub one to rarely two meters in height. It appeared very distinct from *Quercus Mohriana* of the limestone hills, but along the contact of the two formations there were some very puzzling forms, that suggested either hybridization or the possibility that the two extremes might be ecological responses to the different environment. *Artemisia filifolia* was also common in the sands, and a little shrubby Pentstemon (*P. ambiguus*) was in full bloom. The latter had a profusion of pale lavender blooms and was one of the most conspicuous and showy plants I have seen in this region. Amongst herbaceous species *Dithyreaa Wislizeni* was very abundant, and *Houstonia humifusa*, *Anogra albicaulis*, *Monarda clinopodioides* and *Hymenopappus corymbosus* were conspicuous. *Yucca constricta* was in full bloom and I made photographs of this and of several of the other plants.

Pecos, Texas, May 18th.

After exploring the Pecos River along the last few miles of its course and its junction with the Rio Grande, I was anxious to see it farther up and learn how the flora at this point compares with that of the lower canyons. The contrast is certainly striking but so far as the flora is concerned it is also disappointing. The surrounding country is all rather level and the surface is sandy and the soil strongly gypsous and saline. In consequence it is extremely sterile and in many spots absolutely devoid of plant life. A few stunted Mesquite bushes are the only ligneous plants over wide areas. Both the glabrous and pubescent varieties were noted. The soil appears

generally to be too poor even for Cactus, although a few discouraged looking specimens of *Opuntias* and a small *Echinocereus* were seen. In a few places *Lippia lanceolata* and *Lepidium alyssoides* were blooming bravely and plants of *Statice Limonium* were coming up. Along the banks of the river, however, one tree is abundant and conspicuous and serves to relieve the dreary monotony with its bright green foliage. This is *Tamarix gallica*, the Salt Cedar, a native of the Mediterranean region, which has been introduced and thoroughly established in this part of Texas. It lines the low banks of the river here for miles and appears to flourish everywhere along ditches and ponds or wherever there is a little moisture.

The list of woody plants here is a very short one; besides those just mentioned I saw a few specimens of *Condalia obovata* and *Lycium Torreyi*, and *Allenrolfea occidentalis* was locally abundant in flats and depressions.

NOTES

The Arnold Arboretum during the Fiscal year ended June 30, 1928.

The Arboretum.—In Massachusetts the winter of 1927-28 will be remembered for its mildness and absence of heavy snowfalls and while ground covering plants suffered on this account the trees and shrubs in general were uninjured. During the autumn of 1927 and the spring and early summer of 1928 good rains fell and the Arboretum shows the benefit of two successive favorable years. It is many years since the plants have been so well favored. The Lilacs, which were severely pruned in the spring of 1927, made great growth and many of them flowered quite freely this year. The trusses of flowers were remarkably large but no increase in the size of the individual blossom was noticeable. This is rather curious since one would have expected increased size in the flower as well as in the flower truss and in the leaf itself. The Japanese Cherries at the Forest Hills Gate flowered as freely as usual, while the double flowering sorts on Bussey Hill were finer than they have ever been before. There is a difference of more than a fortnight in the flowering season of these two groups which adds greatly to their value in gardens. The collection of double flowering varieties on Bussey Hill is grafted on understocks of the Sargent Cherry (*Prunus serrulata sachalinensis*) and the trees clearly demonstrate the value of this species as an understock for the Japanese Cherries. The Crabapples, more especially the collection at the foot of Peters Hill, bore abundant blossoms and for the first time in the Arboretum the two plants of *Malus theifera* and two plants of *Malus toringoides* flowered freely. Heretofore, one of the plants in each case has enjoyed an off season. There was very little blossom on the Kalmias this year but the Hybrid Rhododendrons were better than usual. They wintered fairly well after having made a good growth the previous season.

The winter was marked by a very low snowfall and this had a disastrous effect on the dwarf evergreen plants familiarly called groundcovers. In

most of them the foliage was severely browned and not a few plants were killed outright. Heather (*Calluna vulgaris*) suffered badly in this respect and new plantations had to be made in the Shrub Garden. The *Davidia* on Bussey Hill bore a few blossoms for the first time. The bracts, however, were imperfect and gave but a poor idea of the real beauty of this tree. At Newport, Rhode Island, where the climate enjoys the influence of the gulf stream, the *Davidia* flowered amazingly this year.

In recent years the important work in the Arnold Arboretum has been finding proper space for the different collections so that the individuals might develop into worthy specimens. Last autumn rearrangement of the *Azalea* group on Bussey Hill and the spreading out of the many Chinese plants was undertaken. Near the Administration Building a planting of Crabapples and groups of the new Chinese Conifers were carried out. In a year or two this should make a very pleasing feature at the Jamaica Plains Entrance.

An important event of the year was the building of a new propagating house and pits and establishing a new nursery on the Bussey property. The Arboretum now has a model propagating plant and attached to the propagating house is a small pathological laboratory.

During the year 3964 plants (including grafts and cuttings) and 1518 packets of seeds were distributed in the United States, Cuba, Great Britain, Germany, Poland, Holland, Sweden, France, Canada, Nova Scotia, Russia, New Zealand, Australia, India and Czechoslovakia.

There have been received 4460 plants (including grafts and cuttings) and 419 packets of seeds from the United States, Cuba, Great Britain, France, Japan, Sweden, Canada, New Zealand, India, Germany, Greece, Holland, Denmark, and Manchuria.

Visitors to the Arboretum were more numerous than usual. On June 7, 1928 a delegation of ladies representing the Philadelphia Horticultural Society made a two day's pilgrimage. Artists, photographers and plant lovers in general visit the Arboretum in increasing numbers every year. The newly established bus service over the Parkway doubtless brings many additional visitors. Some 796 persons registered at the Administration Building. Among these were visitors from such foreign countries as Great Britain, Formosa, Japan, Holland, Denmark, China, Germany, Panama, South Africa, Palestine, Philippine Islands, Federated Malay States, Poland, France and Hungary. — E. H. W.

The Herbarium.—The Herbarium now contains 297,018 sheets, 11,196 sheets having been added during the time from July 1, 1927 to June 30, 1928. Among accessions approximately 1,850 plants came from North America, 1,600 from Europe and western Asia, 3,050 from China, about 650 from southern Asia and Malaysia, 850 from Australasia and 750 from tropical Africa. Among the more important single collections received may be mentioned 1,627 plants collected by J. F. Rock in northwestern China and northeastern Tibet; 1,465 plants from the United States

National Herbarium collected primarily by P. C. Standley in Central America; 589 plants added from the collection made by D. H. Linder in tropical Africa; 568 plants collected by J. G. Jack in Cuba; 1,384 plants received through the National Southeastern University at Nanking; 454 plants collected by E. J. Palmer in southwestern United States; 510 plants of Australasia collected by L. J. Brass; 346 plants of Greece collected by J. Mattfeld and 747 plants from Europe and western Asia received from J. Bornmüller.

There have been distributed from the Herbarium 11,863 specimens among thirty-nine institutions in the United States, Canada, Europe, Asia Australia and Africa. This is one of the largest distributions in the history of the institution.

Botanical exploration has been carried on in different parts of the world during the year. The most important expeditions are those to the New Hebrides and to Madagascar. The first named islands whose vegetation is still incompletely known are now being explored by Mr. S. F. Kajewski who left Australia at the end of January; this expedition is financed jointly by the Arnold Arboretum and the California Botanic Garden. At the beginning of June, Dr. H. Humbert, who already has made important contributions to the knowledge of the flora of Madagascar, started for this island accompanied by Dr. Charles T. Swingle to collect for the Arnold Arboretum and the U. S. Department of Agriculture. At the end of April Mr. Fang of the National Southeastern University of Nanking went to Kweichow and the adjoining regions of Szechuan on a collecting tour subsidized by the Arnold Arboretum. In Cuba Assistant Professor J. G. Jack continued the botanical exploration of the region near the Harvard Tropical Garden at Soledad during the months of February to June; for about six weeks, in February and March, he was joined by Mr. A. Rehder. Mr. J. E. Palmer started on his collecting tour in April and went first to Arkansas and eastern Oklahoma and then to various localities in southern Texas; in the Davis Mountains he supplemented the extensive collections he made there in the autumn of 1926. He also visited the Chisos Mountains and returned to the Arnold Arboretum beginning of July (see p. 153-187 for an account of these trips). In June Dr. C. E. Kobuski accompanied by Dr. J. T. P. Byhouwer made a short collecting trip to New Jersey and Pennsylvania. In Australia Mr. C. T. White continued his exploration of the Queensland flora in which the Arboretum participated. Early in September 1927 Dr. J. Mattfeld returned from his botanical tour to Bulgaria and European Turkey which was mentioned already in last year's report.—A. R.

The Library.—During the year the Library has added 590 bound volumes, 380 pamphlets and 558 photographs including 305 taken by Mr. J. F. Rock in northwestern China and northeastern Tibet, 75 taken by Dr. Mattfeld in Greece and 50 from the Rochester park department, making a total of bound volumes 37,736, pamphlets 8,939 and photographs 13,915,

together with about 250 unbound volumes. Of the 350 periodicals, bulletins and reports coming from all parts of the world 178 are received from botanic gardens, universities and other institutions, and societies in exchange for the *Journal* and the *Bulletin* of the Arboretum, and 25 by gift. About 100 books and reprints have also come from Russia and Lettland in exchange for Arboretum publications and herbarium specimens.

Over 1200 cards have been inserted in the catalogue of books, 600 cards in the catalogue of photographs, 550 cards for plates representing type specimens, and 2500 cards in the "Card-index of new genera, species and varieties of North and South American plants" published by the Gray Herbarium. In the manuscript "Index of illustrations and of new genera, species and varieties of ligneous plants since 1915," prepared at the Arboretum, 3778 cards were inserted bringing the total to 79,773. This Index is unique and makes available all references to new ligneous plants to date, exclusive of those published in floras.

The count of books bound is about 500 and of titles catalogued 900.

Though not a lending library over 100 books have gone out, chiefly as inter-library loans.

The number of inquiries coming to the Library has greatly increased during the year and ranges from requests for lists of books on certain subjects to verified references, photostat copies and the "best book" for a given purpose.

Mention of the more interesting accessions during the period from October 1926 to October 1927 will be found in the *Journal* for October 1927, and from that period to February 15, 1928 in the *Journal* for March, 1928. Among the works added since that date are:

WOCHENSCHRIFT für gärtneri und pflanzenkunde. Jahrg. 1-11, 1858-1868.

THE LINDLEY library. Catalogue of books, pamphlets, manuscripts and drawings. 1927.—Gift of the Royal horticultural society.

PECHEY, John. The compleat herbal of physical plants. Containing all such English and foreign herbs, shrubs and trees, as are used in physick and surgery. And to the virtues of those that are now in use is added one receipt, or more, of some learned physician. By John Pechey, of the College of Physicians, in London. Printed for Henry Bonavicke, at the Red Lyon in St. Paul's Churchyard. 1694.

WILSON, E. H. More aristocrats of the garden. 1928.—Gift of the author.

FYSON, P. F. Madras flowers. 1912-14.—Gift of Dr. Lemon Uhl.

MASSART, Jean. Esquisse de la géographie botanique [With annexe]. 2. vol. Bruxelles. 1910.

REVUE bretonne de botanique pure et appliquée. 1920-27.

ZEITSCHRIFT für gartenbau; organ der Baltischen gartenbauvereine. Vol. 1-7, 9. Reval 1904-12.—Gift of Dr. Karlis Starcs. Only known copy in the United States.

- REVUE horticole de l'Algérie. Vol. 17-31. 1913-27.
- SIMMONDS, J. H. Trees from other lands for shelter and timber in New Zealand. Eucalypts. 1927. 104 plates.
- NEDERLANDSCHE kruidkundig archief. 1904-08, 1910-26.
- [ZABEL, Hermann. Catalogue of the botanic garden of the Forest academy of Münden, Germany.] N. P. [1869-1912?] MS.
- REVUE des eaux et forêts. Vol. 62-64. 1924-26.
- PECORI, Raffaello. La cultura dell'Olivio in Italia. 1891.
- KEW—Royal botanic gardens. Handlist of rock garden plants. 1925.
 Handlist of hardy monocotyledons. 1925.
 Handlist of herbaceous plants. 1925.
 Handlist of tender monocotyledons. 1915.
 Official guide to museums of economic botany. 1927.
 Popular official guide. 1928.
 Official guide to the North gallery. 1914.
 Illustrated guide. 1927.
 The wild fauna and flora. 1906.
 Selected papers. iii. Rubber. 1906.—Gifts of Dr. Arthur W. Hill.
- MIYOSHI, Manabu. Japanese cherries. 3 vol. Text and 2 vol. of plates.
- VALLOT, J. Essai sur la flore du pavé de Paris. 1884.
- NORTH, Marianne. Further recollections of a happy life. 1893.
- HEAD, George. Forest scenes and incidents. 1829.
- BATSCH, A. I. G. C. Beyträge und entwürfe zur pragmatischen geschichte der drey natur-reiche nach ihren verwandtschaften. Gewächsreich. Theil. 1. 1801. Photographs of pp. 19, 29 & 30 from copy in Universitäts Bibliothek at Jena.
- PRINCE, William. [Nursery catalogues.] Photostat copies of two broad-sides in possession of the New York agricultural experiment station at Geneva. They were printed in New York, the first reads "To be sosed (sic) by William Prince at Flushing-Landing 1771," and offers among other plants "English Cherries, Plumbs, Nectarines, Rasberries, Evergreen Trees and Shrubs, Timber Trees and Flowering Shrubs." The second was issued in 1790, with the addition of Roses.
- [FRÖLICH, Karl. Die alpenpflanzen der Schweiz. Lief. 1-10. Teufen. 1853-55.] 62 colored plates. No more published. Rare.
- A supplement to the Catalogue of the Library of the Arnold Arboretum will be published during the coming year.—E. M. T.

Staff of the Arnold Arboretum, 1928-29

OAKES AMES, A.M., Professor of Botany, Supervisor
ERNEST HENRY WILSON, A.M., Keeper
JOHN GEORGE JACK, Assistant Professor of Dendrology
ALFRED REHDER, A.M., Curator of the Herbarium
JOSEPH HORACE FAULL, Ph.D., Professor of Forest Pathology
KARL SAX, Ph.D., Associate Professor of Cytology
ERNEST JESSE PALMER, Collector & Assistant in the Herbarium
CLARENCE EMMEREN KOBUSKI, Ph.D., Assistant in the Herbarium
ETHELYN MARIA TUCKER, Librarian
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ELIZABETH DEAN BENNETT, A.B., Assistant in the Library
LOUIS VICTOR SCHMITT, Superintendent
WILLIAM HENRY JUDD, Propagator

ERRATA

- Page 25, line 19 from below *for* var. *Rockii* *read* var. *Rockii*
“ 29, between line 4 and 5 from below insert ALFRED REHDER
“ 78, line 21 *for communus* *read communis*

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